MARINE REVIEW

VOL. XXXI. CLEVELAND, O., APRIL 6, 1905. No. 14.

From Pittsburg to Tidewater

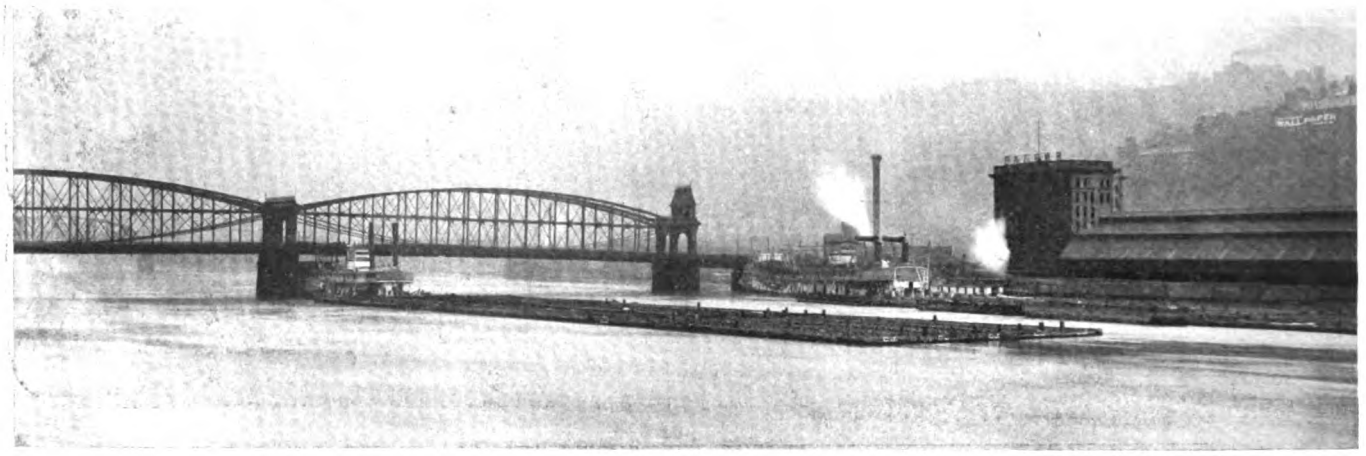
The improvement of none of the great inland waterways of the United States offers greater opportunities for increased shipping, low transportation costs, and the industrial development of contiguous territory, than the proposed canalization of the Ohio river from Pittsburg to the Mississippi. At its head is the greatest tonnage producing district in the world, whose railroad development has been greatly impeded by natural conditions, and which are inadequate for the movement of so great a tonnage. This river, properly improved for continuous navigation, therefore offers shipping possibilities which cannot be conceived. The tonnage of Pittsburg exceeds that of any other city in the world by so great a margin that she will never be overtaken. The tonnage of such great ports as New York, London, Liverpool, Hamburg and Antwerp combined, fail by a margin of 7,000,000 tons to reach the enormous total of this great industrial center in any one year. In 1902 the rail and river shipments aggregated 86,636,680 tons, the Pittsburg harbor alone contributing 10,916,489 tons of the total. This port, though only on an inland waterway, holds the world's record for a single day's shipment by water, 399,350 tons passing through the harbor on June 24, 1903. The estimated annual gross tonnage of the Ohio and its tributaries is 30,000,000 tons and 600 steamboats navigate these rivers. During 1902 over 4,000,000 passengers were carried in this system without an accident.

Affording a natural outlet from Pittsburg to tidewater for the tremendous tonnage of coal, and iron and steel products originating on the Monongahela and Allegheny rivers, shipping is restricted to limited periods of the year when nature intervenes and provides a navigable channel. The Ohio borders six great states with industrial communities scattered over its entire length. With its partially improved tributaries it forms a system of the most magnificent waterways in the world. The canalization of this great waterway will put the ports of the Pacific in direct communication with the manufacturers of Pittsburg, and open the markets of the Orient, by way of the Isthmian canal, to the Ohio and Mississippi valleys. By way of this improved system, Pittsburg's steel products can be delivered on the Pacific coast at a lower cost of transportation than can be afforded by the railroads to the steel works west of the Mississippi, and will provide a lower shipping cost to the Orient than can be secured by any of the great foreign steel making nations who now practically control this trade.

With all its disadvantages, the average cost of shipping from Pittsburg to New Orleans by the present system is the lowest transportation cost in the world amounting to only

PITTSBURG WHARF, MONONGAHELA RIVER, BETWEEN SMITHFIELD STREET BRIDGE AND WABASH BRIDGE ON MARCH 23, SHOWING PITTSBURG SKY LINE AND COAL BOATS. STEAMER CRESCENT, OWNED BY C. JUTTE & CO., PITTSBURG, FLEET CONSISTING OF TWELVE COAL BOATS CONTAINING 12,000 TONS OF COAL.

[*Photo Courtesy C. Jutte & Co., Pittsburg.*



MONONGAHELA RIVER AT FLOOD STAGE TUESDAY, MARCH 21. STEAMER CRESCENT, C. JUTTE & CO., WITH TOW OF TWELVE COAL BOATS IN FOREGROUND CONTAINING 12,000 TONS, AND STEAMER JOE WILLIAMS, MONONGAHELA RIVER CONSOLIDATED COAL & COKE CO., WITH TOW OF TWENTY-FOUR NEW TYPE COAL BARGES, CONTAINING 30,000 TONS OF COAL, THE LARGEST COAL TOW EVER SENT OUT OF PITTSBURG HARBOR.

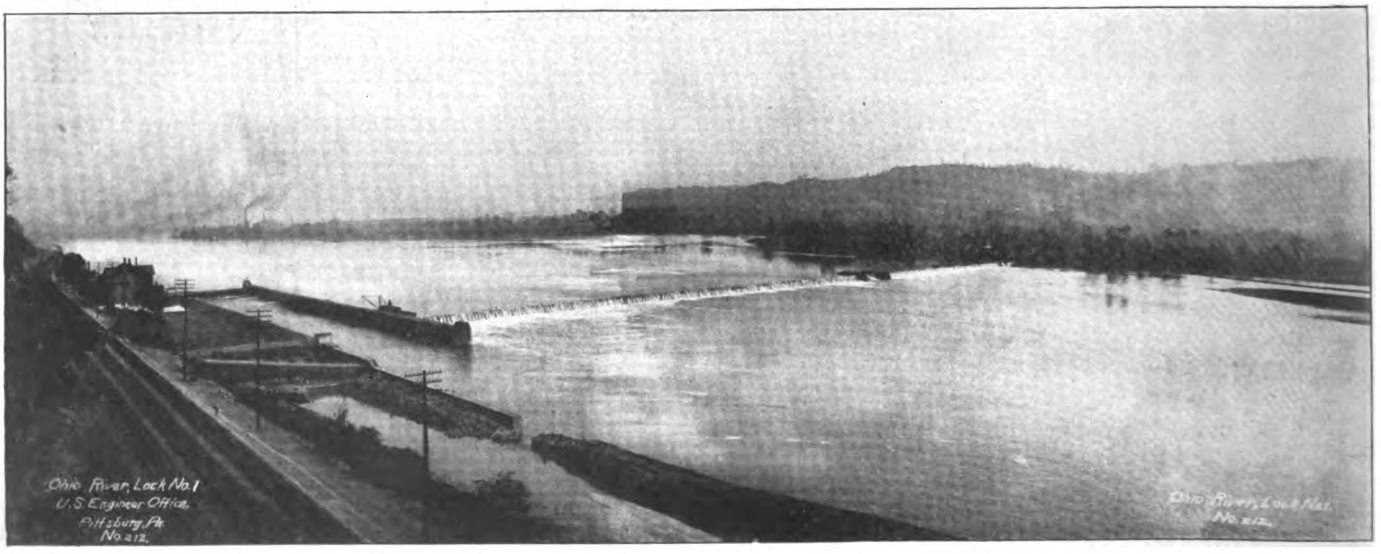
[*Photo Courtesy C. Jutte & Co., Pittsburg.*

.675 mills per ton mile, and it is estimated that with an improved 9-ft. channel on the Ohio this will be reduced to .39 mills per ton mile.

The lowest cost of rail transportation is over the Bessemer & Lake Erie railroad which carries ore from Conneaut, O., to the works of the Carnegie Steel Co. in the Pittsburg district, and its lowest average cost per ton mile was made in 1901 amounting to 1.87 mills, and last year it rose to 2.10 mills. On the lower improved portion of the Monongahela a large steel concern carries coal to its steel works and coke ovens at an actual cost of .8 mills, and with liberal allowance for depreciation and interest on investment the cost per ton mile is only 1.8 mills. The following compares rail and waterway transportation costs:

	Cost per ton mile. Mills.	Lowest cost ton mile. Mills.
Average cost per ton mile, vessels passing through St. Mary's Falls canal, 1894-1903	1.00	.79
Average cost per ton mile, Pittsburg to New Orleans, present freshet system	.675	
New Orleans, on improved 9-ft. channel	.39	
Average cost per ton mile, shipping coal on improved Monongahela river of one of the largest shippers	1.8	
Average cost per ton mile one of the leading trunk lines, 1894-1903	3.99	3.79
Average cost per ton mile Bessemer & Lake Erie Railroad Co., 1901, without exception cheapest rail transportation in the world	1.87	
Bessemer & Lake Erie Railroad, 1904	2.10	

Surveys have already been made to provide a 6-ft. channel from Pittsburg to a point below Cincinnati, and thirty-seven locks and dams have been located. Two of these have been completed, Davis Island dam at Pittsburg, known as No. 1, Ohio river, and No. 6, at Beaver, Pa., twenty-eight miles below Pittsburg. Work on the intermediate dams between Pittsburg and Beaver is already under way and these four additional locks and dams will be available within the next two years. Below Beaver work on five are under way. A 6-ft. channel is however considered inadequate to the needs of successful navigation and a 9-ft. channel is now desired by the river interests. The existing dams can be raised the remaining 3 ft. at little additional expense, and the entire canalization to the 9-ft. depth will not entail a very great expenditure over that already anticipated. Below Cincinnati to the mouth of the river fourteen locks and dams are desired, and with the completion of this improvement a continuous 9-ft. channel will be provided navigable almost the entire year. Taking cognizance of the demands for a deeper waterway, the



DAVIS ISLAND DAM MOVABLE WELL WICKETS UP.

members of the congressional rivers and harbors committee will, early in May, make a trip over the Ohio for the purpose of considering the advisability of recommending this improvement.

The great saving in transportation costs that can be effected by a 9-ft. channel over the proposed 6-ft. waterway is shown by the following table:

SUMMARY STATEMENT, COST OF TRANSPORTATION.

On basis of 2,000,000 tons on the Monongahela and 3,500,000 tons per annum on the Ohio.

Towing in fleets of barges	Miles	Average tons in fleets	Average cost per ton, cents	Cost per ton, mile, mills	Capital invested	Annual operating expenses	Remarks
†Monongahela River, Coal Mines to Pittsburg	52	2,500	9.4	1.8	$ 526 000	$ 83 946 50	Empty barges returned to mines.
Ohio River, Pittsb'rg to Louisville, river improved to 6 ft. depth.	600	8,500	37.6	.63	2 424 000	1 026 510 00	Empty barges returned to Pittsburg
Ohio River, Pittsb'rg to Louisville, river improved to 9 ft. depth.	600	12,500	24.1	.4	2 080 000	845 000 00	Empty barges returned to Pittsburg
†Ohio River, Pittsburg to Louisville, present freshet system	600	15,000 to 25,000	15.8	.76	5 000 000	1 604 800 00	Empty barges returned to Pittsburg
Ohio and Mississippi rivers, Louisville to New Orleans, river improved to 9 ft. depth.	1360	25,000	53 38	.39	3 480 000	1 868 632 50	Empty barges returned to Louisville
Pittsburg to New Orleans on improved 9 ft. depth	2000	.....	77.48	.39	.....	.....	Empty barges returned to Pittsburg
†Pittsburg to New Orleans, present freshet system.	2000	.....	135 00	.675	.....	.....	*Not returning empty barges, but including their value in cost of transportation.

*The boats in use are of cheap construction.
†Actual practice.

The tremendous increase in Monongahela river shipping aggregating almost 6,000,000 tons in the past ten years is almost entirely due to the improvements made in that period and which afford a navigable channel almost the entire year. One large Pittsburg steel manufacturing concern makes its own coke at its works in the city limits, bringing the coal from its own mines from three loading points and discharges the same to three unloading stations. The distance from the mines to the works is fifty-two miles. For several years past this company has been using from 2,000,000 to 2,300,000 tons of coal per annum and the expense for transporting this coal, including the return of empty barges to the mines is 4.2 cents per ton. Allowing 15 per cent for depreciation and ample interest on investment, the cost for transporting this coal a distance of fifty-two miles is only 9.4 cents.

The growth of Monongahela river shipping for a period of twelve years is shown by the following table:

Calendar Year.	Tons.
1892	4,163,304
1893	4,142,644
1894	4,913,089
1895	4,555,703
1896	5,989,159
Fiscal Year Ending June 30.	
1898	6,117,973
1899	6,954,955
1900	5,994,975
1901	6,856,507
1902	9,100,887
1903	11,369,814
1904	9,268,733

The first dam on the Ohio, known as Davis Island dam, has been in use for twenty years. It affords a depth of 10 ft. up to the wharves in the business section of the city. From the wharves at Smithfield street this pool extends a 9½ ft. depth up the Monongahela, a farther distance of about one mile to the first dam on the Monongahela, so that boats of such a draught could be passed into pool No. 1 of that river. All that is required to make the Monongahela navigable for vessels of a 9-ft. draught at all the seasons of the year, is to place flashboards on the existing dams, about 3 ft. high, replacing the boards 2 ft. high now in use. This has already been recommended and approved by the corps of engineers, United States arm, and with this progress made towards securing a 9 ft. depth on the Monongahela, it is clearly justifiable to assume that the general traffic will be ready to take advantage of the extension of a similar depth on the Ohio, before the dams on the latter can be completed even as far as Wheeling.

To illustrate the possibilities of navigation on the Ohio in case of its improvement by means of adjustable dams, the following table has been prepared:

Table exhibiting the number of days the Ohio river is navigable for vessels of 6 ft. and 9 ft. draught, without the aid of dams, based on five years' work, 1895 to 1899 inclusive.

Division.	Length of division miles.	No. of dams proposed and under construction.	Slope per mile, feet.	Minimum No. of days any one year with channel depth.		Maximum No. of days any one year with channel depth.		Mean of 5 years, days per year with channel depth	
				6 ft. or over.	9 ft. or over.	6 ft. or over.	9 ft. or over.	6 ft. or over.	9 ft. or over.
Pittsburg to Beaver Dam, Pa.	28 8	6	1.47	95	63	201	101	161	79
Beaver Dam to Wheeling, W. Va.	58.2	6	.72	135	83	247	145	202	116
Wheeling to Parkersburg, W. Va.	92 3	6	.53	123	81	243	189	203	114
Parkersburg to Mouth of Kanawha River.	80 1	7	.62	130	85	274	185	241	146
Mouth of Kanawha River to Cincinnati, O.	*221 6	12	.39	122	87	255	195	212	153
Cincinnati to Louisville, Ky.	132	.....	.19	217	157	360	320	303	255
Louisville to Evansville, Ind.	183	.....	† .25	131	71	291	135	222	104
Evansville to Cairo, Ill.	183	.....	.34	164	118	320	261	265	207
Cairo down Mississippi River	.....	.....	.....	274	229	365	360	317	285

*12 miles below Cincinnati, dam 37.
†26 ft. fall deducted for falls at Louisville.

It will be observed from the table that the number of days per annum during which there is a natural stage of 6 ft. or of 9 ft. or over, increases more or less regularly in descending the river. From Pittsburg to Beaver, or dam No. 6, for instance, the mean number of days of 6 ft. navigation afforded is 161, while from Beaver down it is 202 days per annum. This table shows that with the river improved even no further down than Wheeling, a great increase in the river traffic can certainly be relied on, and that the business can be done with less risk, and with considerably less capital invested in boats. The coal and other barge traffic in the Ohio from Pittsburg has not grown materially for a number of years past and it may be said that it has reached the limit for economical investment of capital, handicapped with such irregularities in the seasons as to make the factor of profit a very uncertain quantity. There has been developed on the Ohio a towing system of the first importance, with steamers in use of greater steering power than can be found elsewhere in the world.

The traffic in the Pittsburg harbor with the improvements on the Allegheny river has grown tremendously and for the past four years has been as follows:

COMMERCIAL STATISTICS, PITTSBURG HARBOR.

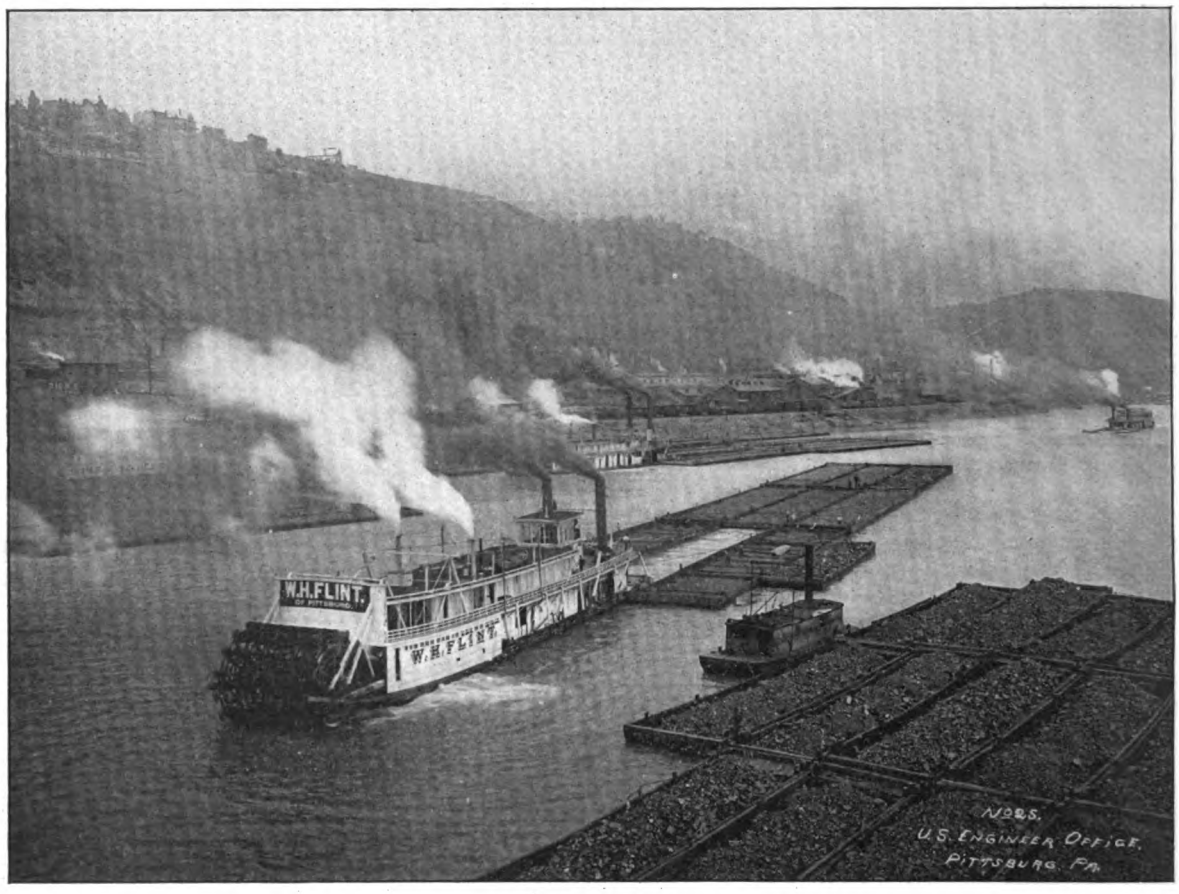
Calendar Year.	Tons.
1900	8,141,451
1901	10,916,489
1902	12,252,405
1903	12,240,360

Classified statement of river traffic in Pittsburg harbor for calendar year, 1903:

Commodities.	Tons.
Coal	9,398,664
Gravel	1,056,223
Sand	1,270,115
Steel Rails	45,106
Steel and iron products, miscellaneous	69,318
All other commodities	400,934

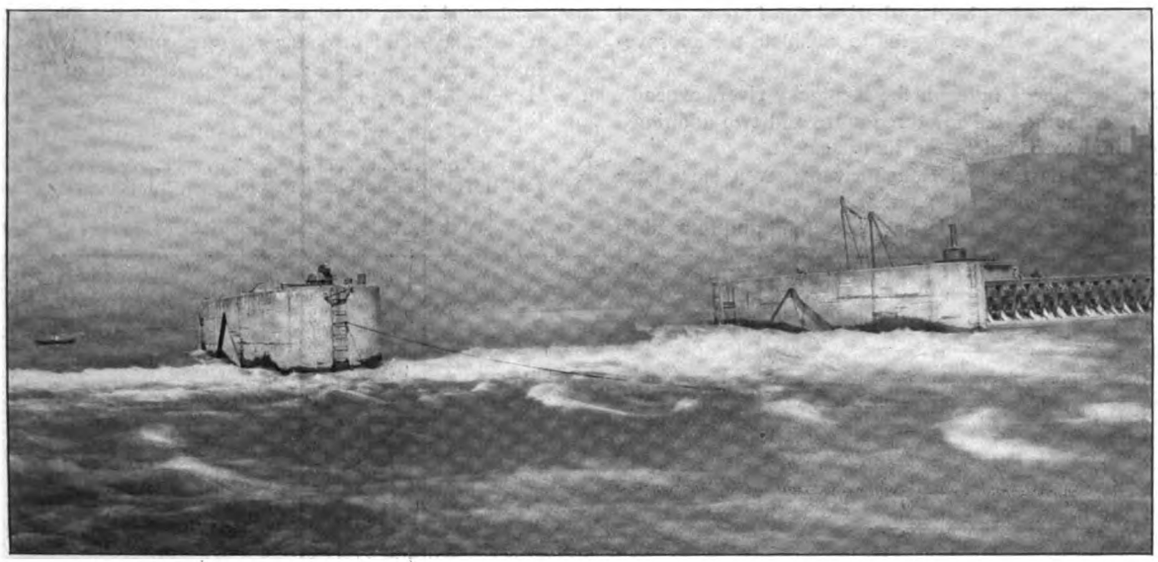
The aggregate tonnage of freight on the Allegheny river during the calendar year 1903 was 2,293,429 tons, while during the fiscal year 1904 there passed through Davis Island dam to lower river points, 5,289,215 tons.

To secure continuous navigable conditions on the Monongahela river, congress, as early as 1833, authorized a survey of the river from Pittsburg to Brownsville, a distance of thirty-three miles. After the survey was made, means for carrying out the work were not authorized, and as a last resort the legislature of Pennsylvania was appealed to and a franchise was granted the Monongahela Navigation Co. to improve the Monongahela in the state of Pennsylvania. The act limited the lifts at the proposed lock to 4½ ft. and in 1840 locks and dams Nos. 1 and 2 were completed. In 1844, 600,000 bu. of coal passed through the completed locks and the freight traffic continued to increase enormously. In 1844 locks Nos. 3 and 4 were completed, having chambers 50 ft. wide with an available length of 158 ft. The growing demands for increased locking facilities resulted in the erection of second locking chambers at locks Nos. 1 and 2 in 1848, and eight years later locks 5 and 6 were opened to navigation above Brownsville. No further improvements were made by this private corporation until 1883 when lock No. 7 on the upper Monongahela was completed, and in 1885 the second locking chambers were added to locks 3 and 4. Shortly after the completion of lock No. 7, the coal operators on the Monongahela river began a concerted movement to have this great waterway opened to free navigation and congress was appealed to to condemn the property of the Monongahela Navigation Co. At that time congress authorized an expenditure for the improvement of the Kanawha river in West Virginia, which would enable the coal operators along that river to reach the Ohio absolutely free, 231 miles nearer the markets of the west and south than the mouth of the Monongahela. At that time the average toll charge on the Monongahela was 6½ cents a ton for passing through all the locks, and this was no inconsiderable item against which the Monongahela river operators had to contend. In 1886 congress authorized the secretary of war to ascertain the value of the property of the Monongahela Navigation Co., and on Aug. 11, 1888, an appropriation was made in the rivers and harbors bill providing for the purchase of lock No. 7. No decision could be reached, however, as to the price of the property, and after still further agitation an effort was made to acquire the entire property by condemnation proceedings for $3,761,615.46 and purchased by the government and on July 7, 1897, the river was opened to free navigation. Locks 8 and 9 on the upper Monongahela in West Virginia were built by authority from congress and completed in 1889, and since the property was purchased from the Monongahela Co. in 1897, six additional locks were built on the upper Monongahela and fifteen are now in operation.



PART OF PITTSBURG HARBOR BELOW SMITHFIELD STREET BRIDGE.

To provide increased harbor facilities, Davis Island dam, known as lock No. 1, Ohio river, was completed, located a few miles below the confluence of the Monongahela and Allegheny rivers. The lock was opened to navigation in 1885 and greatly improved the shipping facilities of the Pittsburg harbor. Prior to the completion of this dam it was impossible to navigate the Allegheny river with steam craft of the lightest draught during low water periods, which frequently continued for months at a time. Since the completion of this dam a navigable depth



HERR ISLAND DAM WITH THE BEAR TRAPS LOWERED.

on the Allegheny at Pittsburg of 8 ft. has been afforded. Herr Island dam, No. 1, Allegheny river, was built by government appropriation and opened to navigation Jan. 1, 1903. Locks and dams 2 and 3 on the Allegheny are now under construction and when completed will be a great aid to shipping on this river. The annual tonnage of the river above slack-water improvements in the course of construction is about 400,000, extending over 230 miles of river from Tarentum, Pa., to Olean, N. Y.

The slack-watering of the lower Ohio was begun by the location of six locks and dams below Davis Island dam, and the first of these to be completed is dam No. 6, at Beaver, Pa., about 28 miles from Pittsburg. Work on the intermediate locks and dams is under way and when completed will afford a navigable depth of 6 ft. For improving the Ohio to a point 12 miles below Cincinnati, thirty-seven locks and dams have been located of which two have been completed and are in operation. Work on the following below Beaver is under way: No. 8, 46 miles below Pittsburg; No. 13, 96 miles below Pittsburg; No. 18, 179 miles below Pittsburg; No. 19, 191 miles below Pittsburg and No. 37, below Cincinnati, approximately 12 miles. On the less important tributaries of the Ohio river the following work has been done and is under way towards securing a complete slack-water system in the entire Ohio valley:

On the Little Kanawha the United States has built one lock and dam, has given consideration to the purchase of four owned by a private corporation, and further consideration of an extension of this system higher up the river into the coal field is anticipated.

On the Muskingum ten locks and dams, ceded to the United States by the state of Ohio and largely rebuilt are being operated by the United States.

The Kanawha river has ten locks and dams built and operated by the United States.

One lock and dam have been built on the Big Sandy and

ALLEGHENY RIVER LOCK NO. 1. BEAR TRAPS RAISED HERR ISLAND DAM.

its forks, expenditure has been authorized for four more and seventeen additional will be required to complete the improvement.

Nine locks have been built on the Kentucky river, expenditures have been authorized for three more and two additional will be required to complete the improvement.

On the Green, Barren and Rough rivers, seven locks have been built and one additional is authorized.

On the Tennessee eleven locks have been built and four additional will be required to complete the system. Expenditures have been authorized for two of the four projected.

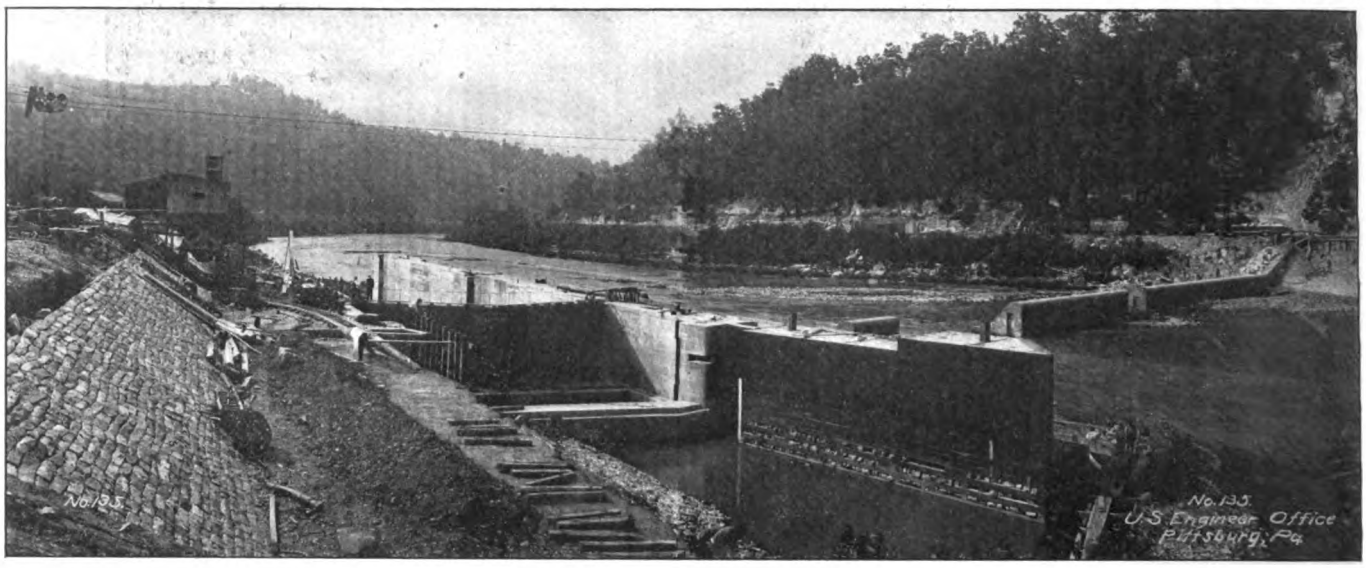
The Cumberland river has eight locks under construction and twenty-eight additional locks are projected. Expenditures have been authorized on nine of the latter.

On the Ohio and its tributaries seventy-four locks have been built, forty additional have been authorized and sixty-five may be regarded as projected with no funds available for their construction. Upon the Allegheny, Little Kanawha and the Wabash, in addition to the work already projected or completed, there may be expected in the future, new projects for from thirty to forty locks and dams.

The appropriation made by congress this year insures a 9-ft. channel from Pittsburg to Beaver on the Ohio, a distance of 28 miles, and provides for the completion of work now under way, as well as the reconstruction of Dam No. 3, Monongahela river. The appropriations are as follows:

CASH AND CONTRACT.

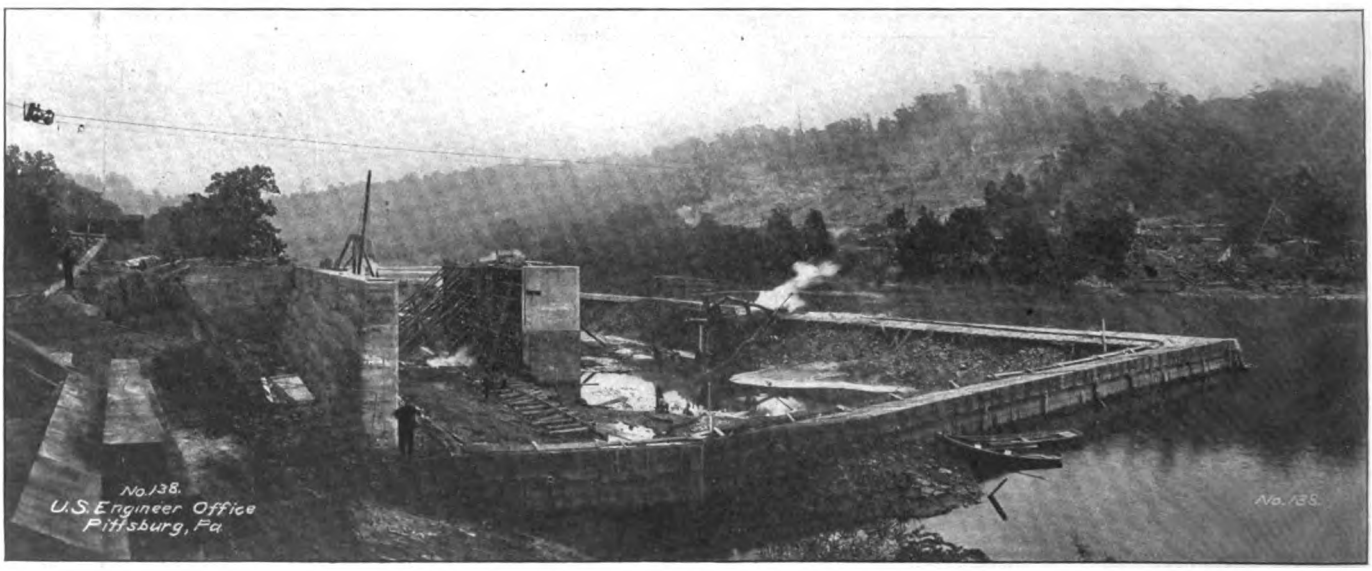
Ohio river	$2,626,376 00
Tributaries of the Ohio	$2.043,272 63
Total	$4,669,648 63



LOCK NO. 12 MONONGAHELA RIVER FIXED DAM.

Of the above total the following sums are for Pittsburg and vicinity:

Pittsburg harbor	$ 10,000 00
Allegheny, Herr's Island and Springdale locks and dams	281,226 63
Monongahela—At locks and dams 5 and 6	7,850 00
Monongahela—Lock and dam No. 3	589,196 00
Ohio—Locks and dams Nos. 2, 3, 4 and 5, and the modification of said locks and dams, and of lock and dam No. 6, so as to secure a depth of 9 ft. in the ports belonging thereto	1,781,376 00
Total	$2,669,648 63



LOCK NO. 14 MONONGAHELA RIVER SHOWING COFFERDAM CONSTRUCTION.

No American ship passed through Suez in March.

Some Leading River Men

To what extent the entire Ohio Valley is indebted to Col. John L. Vance for his indefatigable efforts in behalf of the improvement of the Ohio and its tributaries, future years alone will tell. He has been president of the Ohio Valley Improvement association since its organization in 1895, and the work done by this body attests the strength, energy and influence of its guiding hand. He was born in Gallipolis, O., July 19, 1839, and at the age of seventeen was a teacher in a public school. A year later he was deputy clerk of courts of Gallia county and there commenced the study of law. In 1860 he attended the Law School of the Cincinnati College, from which he graduated in 1861, and the day following his graduation he was ordered to report for military duty at Gallipolis. The year previous he accepted a position on the staff of Gen. Constable of the Ohio militia. On July 5, 1861, he was appointed captain of a company recruited for three years' service and this company took part in forty-seven battles. Honors came to him swiftly on the battlefield and he was successively promoted to the position of major and then lieutenant colonel. He was severely wounded in one of the charges before Vicksburg and after the war engaged in steamboating and was blown up from the steamer Cottage and severely injured. On Oct. 4, 1866, he was married and three sons resulted from the union. In 1867 he started the Gallipolis Bulletin which he successfully edited until August, 1900, when he sold the property. Throughout his entire career he served the public in various official capacities and held many positions of political prominence. In 1872 he was elected a delegate to the Democratic national convention and in 1874 was elected to congress. He only served one term, however, being defeated by a small majority in 1876 and again in 1884. His district was overwhelmingly Republican and in both instances when he was defeated the usual Republican majority was greatly reduced. He was one of the founders of the Hocking Valley Editorial association and was appointed quartermaster general and commissary general of subsistance of the state of Ohio with the rank of brigadier general by Gov. Campbell. Although a Democrat, he has been appointed to other public offices of trust by Republican governors in Ohio, and at present makes his headquarters at Columbus.

MR. JAMES JONES.

James Jones, chairman of the board of directors of the Pittsburg-Buffalo Co., Pittsburg, was born on May 6, 1835, in Wales, and in 1858 came to the United States. His first experience as an operator and employer was in 1878 when he leased the Osceola mines and organized the Osceola Coal Co. In 1880 he sold his interest in the Osceola Coal Co. and with the Hon. W. L. Scott of Erie leased the Grant mines at Carnegie, Pa. Two years later he purchased the Ivill mine near Monongahela City, Pa., and in 1889 secured a half interest in the Catsburg mine at Monongahela City and organized the Catsburg Coal Co., Ltd. A year later he purchased a half interest in the Rostraver mine near Lock No. 4, Monongahela river and organized the Rostraver Coal Co. In 1896, wishing to associate his five sons in business the firm of James Jones & Sons was organized and the local river business, flats and steamers of the T. M. Jenkins Co., Pittsburg, together with the river trade, steamers, retail yards, etc., of John H. Jones, his eldest son, were purchased making this concern one of the largest river shippers of coal in the Pittsburg district. Upon the formation of the Monongahela River Consolidated Coal & Coke Co. in 1899 the entire business of James Jones & Sons was sold and Mr. Jones retired from business. At the earnest solicitation of his sons he accepted the position of chairman of the board of directors of the Pittsburg-Buffalo Co., which position he now holds.

CAPT. W. C. JUTTE.

For more than thirty years, Capt. W. C. Jutte, head of the Jutte interests, with headquarters at Pittsburg, has been prominently identified with river shipping as a coal operator. The Jutte interests at present consist of C. Jutte Co., Peoples' Coal Co., Marine Coal Co., Monongahela & Western Dredging Co., Jung & Sons Coal Co., Mississippi River Coaling Co., Jutte & Foley Contracting Co. and the McKeesport Sawmill Co. The Jutte interests are the largest independent river coal shippers and operate ten steamboats, five dredges, sixty-five barges, 120 flats and 500 coal boats. The Mississippi River Coaling Co., New Orleans, one of the identified interests, is erecting a large stationary coaling dock at the mouth of Lake Borgne canal about twelve miles below New Orleans and will have a storage capacity of 2,000 tons and a coaling capacity of 200 tons an hour. The McKeesport Sawmill Co., another identified interest, builds all the river craft for these various companies while the Jung & Sons Coal Co., New Orleans, looks after the southern coal interests. Capt. Jutte was a member of the partnership of C. Jutte & Co., which was absorbed by the Monongahela River Consolidated Coal & Coke Co.

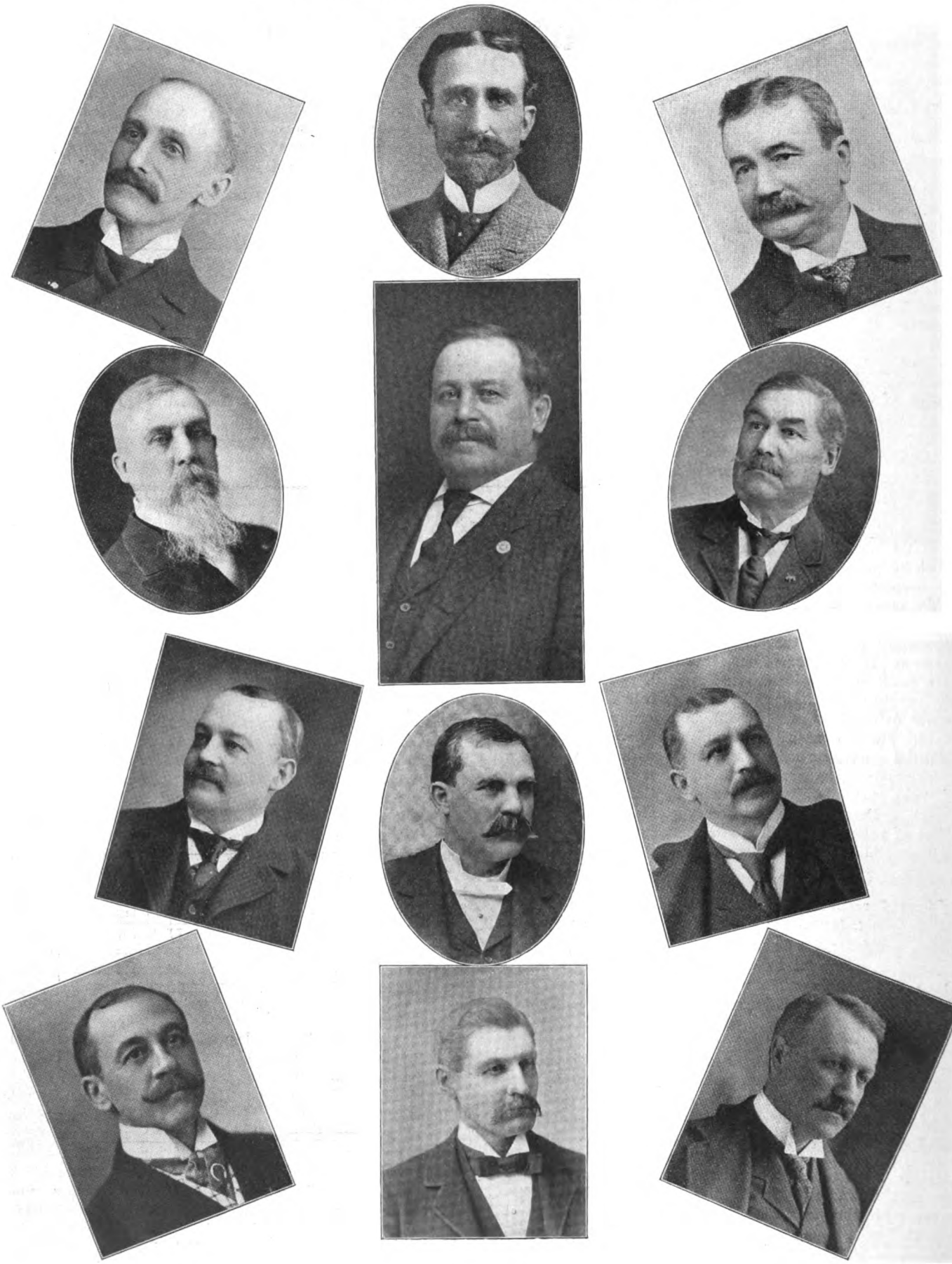
CAPT. WARREN ELSEY.

Capt. Warren Elsey, master of river transportation of the Jones & Laughlin Steel Co., comes to his calling naturally, having first seen the light of day on board a river steamer on the Ohio at Portsmouth on Jan. 15, 1849. At the age of fifteen he was first employed by the Jones & Laughlin interests in the capacity of engineer of a propeller and later secured a pilot's license to run on the lower rivers to New Orleans. In 1881 he purchased the steamer Iron City and in 1884 built the steamer Resolute. In 1886 he engaged with Gray's Iron Line operating the steamers Iron Age, Iron Duke, Ironsides and Resolute and in 1891 became connected with the Jenkins Coal Co. as master of the steamer Frank Gilmore. He was later in charge of the steamer B. D. Wood of the Lysle Coal Co., and six years ago again became connected with the Jones & Laughlin Steel Co. Since in charge of this company's fleet he has built three steamers and purchased one and it has been decided to add another. This company ships from 2,000,000 to 3,000,000 tons of coal from the upper Monongahela to its works annually, and in addition to the steamers owns 179 coal boats and is building twenty-five additional.

MR. FRANCIS L. ROBBINS.

Francis Le Baron Robbins is president of the Pittsburg Coal Co. and the Monongahela River Consolidated Coal & Coke Co., Pittsburg, the largest shippers of bituminous coal in the United States. The river coal shipments are made by the Monongahela River Consolidated Coal & Coke Co., and its fleet of steamers, barges, flats and other water craft is the largest on inland rivers in the United States. Mr. Robbins comes well equipped to the two positions of importance which he holds. When a boy of fifteen he began work in a mine operated by his father at Midway, Pa., and from this humble beginning he has advanced to the head and front of the bituminous coal industry of the United States. Few employers of labor have solved the difficult problems that constantly arise between employer and employe as has Mr. Rob-

Portraits of Prominent River Men



WILLIAM M. REES,
JOHN L. VANCE,
D. A. REES,
CHARLES S. REES,

WM. CHARLES JUTTE,
THOMAS M. REES,
W. B. ROGERS,
CAPT. WARREN ELSEY,

FRANCIS L. ROBBINS,
JAMES H. REES,
JAMES JONES,
CAPT. JAMES A. ANDERSON,

bins, and by his direct way of dealing with them has endeared himself to the thousands on the pay rolls of these two great companies and their underlying interests. It is not alone in the industrial field that his genius for leadership has been recognized. He has taken an active part in politics and was prominently mentioned among others, as a possible successor to the late Senator Quay, and served the state of Pennsylvania as a delegate-at-large at the last Republican national convention.

CAPT. W. B. RODGERS.

The dredging of sand and gravel from the beds of the Allegheny and Monongahela rivers has grown to be one of the important industries of the Pittsburg district, and the Rodgers Sand Co. of which Capt. W. B. Rodgers is the head is the largest shipper in the Pittsburg district. This company operates four steamboats and owns 120 flats. Capt. Rodgers has taken a keen interest in all matters pertaining to the improvement of river shipping and as a member of the rivers and harbor committee of the Pittsburg Chamber of Commerce was prominently identified with the movement for the raising of the bridges spanning the Allegheny river and the removal of dangerous abutments, both of which act as a handicap to navigation on the lower Allegheny. He is also one of the vice presidents of Pennsylvania of the Ohio Valley Improvement association.

JAMES REES & SONS CO.

It is now a little more than a half century since James Rees (deceased), laid the foundations of that pioneer shipbuilding concern, now operated under the corporate name of James Rees & Sons Co., still located in Pittsburg on the site of the original plant. Although nearly sixteen years have elapsed since his death the growth of the industry in that period indicates that it was left in strong hands, the property now being owned and operated by his five sons—James H., Thos. M., W. M., David A. and Chas. S. James Rees was born on Christmas day, 1821, and at the age of six accompanied his parents from Wales and the family settled in a small town near Wheeling, where the father died within a week after arrival. As James was one of a family of nine he soon was compelled to devote his efforts towards the support of the family and he was apprenticed to learn the trade of shoemaking. He later worked on a farm, and when his widowed mother moved to Pittsburg he secured employment in a glasshouse. Being of a mechanical turn of mind he sought employment in a machine shop and learned the machinist trade, and advanced steadily to the position of foreman. In 1842 he was employed by Stackhouse & Thompson to superintend the construction of the engines for the revenue cutter Michigan, which was then being built for lake service and which was launched a year later. In 1848 the partnership of Rees, Hartupe & Co. was formed, which was dissolved in 1851 and he next purchased the establishment of Robert Whiteman. In 1854 he purchased the site of the present plant and engaged in the building of boats, boilers and engines. About the same time he originated a line of freight and passenger packets on the Allegheny river. This venture was marvellously successful, especially regarding the oil carrying trade, which continued until 1868 when it was abandoned to the railroads. Until the time of his death, Sept. 12, 1889, he was identified with James Rees & Sons, boiler manufacturers, and the James Rees' Duquesne Engine Works.

Many of the most famous steamboats which have navigated Western and southern rivers were built by this concern and the honor of building the first steel plate steamboat built in the United States is held by this concern. In 1878 the company's trade was extended outside the confines of the United States and the Francesco Montoyo was built for the Magdalena Steam Navigation Co. of South America. Such excellent satisfaction did this boat give that another of the same dimensions was ordered in 1879 and she was christened the Victoria. The following year the Venezuela was built for the same trade, and in 1881 the Columbia was built for the Irma San Juan river trade in Nicaragua. The fame of these stern wheelers attracted the attention of the Russian government, and from this Pittsburg plant went the drafts and specifications and the mechanics which inaugurated upon the Volga and the Dneiper and other rivers of Russia, the building of these stern wheel steamboats which now navigate those and other streams of that empire. Boats have also been built for service in Mongolia, Siberia, and they now traverse the Yukon, as well as the inland waters of the United States, Canada and Mexico, and in round numbers total over one thousand. On July 1, 1895, the firms of James Rees & Sons, boiler manufacturers, and the James Rees' Duquesne Engine Works, were incorporated under the name of James Rees & Sons Co., with the following officers and stockholders: Jas. H. Rees, president; Thos. M. Rees, vice president and general manager; W. M. Rees, treasurer; David A. Rees, secretary and Chas. S. Rees.

MR. JOHN F. DRAVO.

The title of "Dean of Inland Waters" has been befittingly bestowed on John F. Dravo, who despite his eighty-five years which rest lightly on his shoulders, is still as active in behalf of improved inland river navigation as he was fifty years ago. He was born at West Newton, Pa., Oct. 29, 1819, his parents being Michael and Mary (Fleming) Dravo. Receiving a good common school and college education, he learned the details of the coal business in his father's office and in 1845 he embarked in the coal business for himself. In 1854 he founded the town of Dravosburg, Pa., now a flourishing mining center and thus while actively engaged in coal mining early saw the possibilities of improved navigation on the Monongahela and Ohio rivers. In 1868 he organized the Pittsburg and Connellsville Gas, Coal & Coke Co., becoming its general manager and treasurer and in 1876 was elected president of the Pittsburg Coal Exchange, which position he held continuously for ten years. He was active in securing the organization of the Pittsburg Chamber of Commerce, was one of its charter members and for several years its president. It was largely due to the efforts of Capt. John F. Dravo that the government undertook the improvement of the upper Monongahela river and the location and erection of the Davis Island dam in the Ohio river, and he was in the brunt of the fight for free navigation on the lower Monongahela which was freed by the purchase of the existing locks and dams by the government. His political career has also been remarkable, having been one of the organizers of the Republican party and was a delegate to the convention which nominated Lincoln. He has twice held the position of surveyor of the port of Pittsburg and served two terms in the Pennsylvania legislature. While his home is at Beaver, Pa., twenty-eight miles from Pittsburg, his business interests are in Pittsburg, and every day, winter and summer, he is to be found at his desk. His career has been a remarkable one, and despite his age is active in business and social affairs.

CAPT. JAMES A. HENDERSON.

Capt. James A. Henderson, one of the Pennsylvania vice presidents of the Ohio Valley Improvement association, is president and general manager of the Pittsburg & Cincinnati Packet Line, and vice president of the Pittsburg Terminal & Warehouse Co. The Pittsburg & Cincinnati Packet Line operates three modern packet and passenger boats between Pittsburg and Cincinnati and way points and is the only steamship line operating west and south from Pittsburg. The steamer Queen City, the most handsomely appointed packet boat on the upper rivers, is 235 ft. long, 44 ft. beam and has a carrying capacity of 1,400 tons. Capt. Henderson has been one of the workers for the canalization of the Ohio river, and when the improvements now proposed are completed the Pittsburg and Cincinnati service will be greatly improved.

MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

Published every Thursday by

The Penton Publishing Company,

CLEVELAND, OHIO.

CHICAGO: MONADNOCK BUILDING.
PITTSBURG: PARK BUILDING
NEW YORK: 150 NASSAU STREET.

Correspondence on Marine Engineering, Ship Building and Shipping Subjects Solicited.

Subscription, $3.00 per annum. To Foreign Countries, $4.50.
Subscribers can have addresses changed at will.

The Cleveland News Co. will supply the trade with the MARINE REVIEW through the regular channels of the American News Co.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

APRIL 6, 1905.

The ease with which the owner of a foreign-built vessel can secure an American register for her, by special act of congress, if she happens to have been wrecked anywhere outside the boundaries of the United States, and towed into and repaired in a ship yard in this country, is one of the most discouraging things that now confront the true friends of American shipping. American registry is of no value to these vessels unless they enter into the coastwise trade, in which case the American registry enhances their value anywhere from 50 to 100 per cent. Members of congress seem to take delight, and quite outside of party lines, in encouraging these shameless games of graft. The result is that upright American vessel owners hesitate to place orders in American ship yards for the vessels they need in the coastwise trade for fear their investment will net them a loss when brought into competition with these foreign-built vessels that have been wrecked in foreign waters and patched up in American ship yards. Adventurous Americans now scan the four corners of the earth to discover a foreign-built wreck that may be purchased for a song, towed to the United States, and patched up, and given an American registry, at a cost of from two-thirds to one-half the cost of a newly built American vessel. This is demoralizing to American vessel owners and ruinous to American ship builders. Since the foundation of the government the coastwise trade has been wholly reserved for American vessels, as a consequence of which Americans have cheerfully paid the greatly higher cost of having their ships built in the United States, relying upon congress to keep faith with them, by excluding foreign-built vessels—vessels built at from two-thirds to one-half the cost of similar American vessels—from competition with them. In the last five years five foreign-built vessels, of about 5,000 gross tons measurement, have been admitted to American registry by special acts.

It will be observed that the present issue of the Marine Review is devoted to a discussion of a 9-ft. channel from Pittsburg to tidewater. There is incorporated herewith a paragraph from a recent address delivered by Hon. T. W. Burton, chairman of the committee on rivers and harbors of the house of representatives at Pittsburg, in which it is evident that the attention of the general government is directed to this project:

"Mark my words, gentlemen, the day will come and it is not far distant, when boats will float down the Ohio at all seasons of the year carrying the products of the great city of Pittsburg, the workshop of the world, to every point on the compass where civilization is known. This is not a dream, but as sure as we sit here tonight it will eventually be realized. Do not expect it to happen in a day, in a week, in a month or in a year. It may take a decade, but it will come. You people of Pittsburg have the enterprise and the push. Convince the whole country that you possess this, and convince them that it will be to everyone's interest to have it accomplished."

The 9-ft. channel can be definitely set down as one of the improvements of internal waterways which the government intends making. There is every reason why the government should be generous in the development of the waterways contiguous to Pittsburg; for Pittsburg is, in its tonnage producing capacity, unequaled throughout the globe. Its supremacy in this respect is so clearly established that there is no city which can properly be called second to her. Indeed the tonnage of New York, London, Liverpool, Hamburg and Antwerp added together do not equal the tonnage of this one town of Pittsburg. In 1902 Pittsburg rail and river shipments aggregated 86,636,680 tons. This enormous tonnage too has been attained in the face of most unequal conditions. Shipping on the Monongahela and Allegheny rivers is restricted to that limited period of the year when navigable channels are provided by freshets. During this brief period an enormous commerce is moved upon this river. What, therefore, would be the tonnage were these channels navigable practically the whole year round. Experience has shown that commerce multiplies greatly as the cost of transporting it lessens and here is a system lying dormant the greater part of the year

whose possibilities in reducing freight costs are immeasurable. The annihilation of distance was the triumph of the nineteenth century. It made the interchange of products of sections and of nations possible; but unless an article is cheap its use cannot be enjoyed by the many. Few have riches. An important element in cost is transportation and any undertaking which lessens it contributes a blessing to untold millions. The lowest cost ever attained per ton mile on the great lakes is seventy-nine hundredths of a mill; the average cost per ton mile from Pittsburg to New Orleans by the present freshet system is sixty-seven hundredths of a mill, and it is estimated that on an improved 9-ft. waterway it can be reduced to thirty-nine hundredths of a mill or practically half the cost of moving it on the great lakes or ten times less the cost of moving it on any of the trunk railways of the country. Money therefore wisely and generously expended in improving the Ohio and its tributaries cannot fail to pay fine dividends to the people of the United States. It would vastly enlarge the scope of American markets because it would afford direct communication by water with the ports of the Pacific and open the markets of the orient by way of the Isthmian canal to the Ohio and Mississippi valleys. It would increase Pittsburg's position as a steel making center because its products could be delivered on the Pacific coast at a lower cost of transportation than could be offered by the railways even to the steel works west of the Mississippi. The importance of this cannot be overestimated because beyond the Pacific lies the orient and the steel-making countries of Europe have the advantage of distance at present in supplying those countries with steel products.

FREIGHT SITUATION

The dock managers have been in continuous session for a week past with the longshoremen and while the committees appointed at their joint conference have reached agreements on nearly all points, the important one of hours of labor is yet unsettled. It is regarded as likely that the dock managers will pay the wage scale of 1903, which was 7½ per cent in excess of the scale of 1904 as far as the shovelers and hoisters are concerned. The workmen, however, have been strenuously urging the adoption of a ten-hour day but this the managers feel that they cannot grant owing to the great amount of work that must be done this year. The men at present work eleven hours a day. Pending this settlement there is absolutely no talk of moving vessels. Some of the owners thought of making a start during the latter part of the present week or the early part of next week, but all plans are now in abeyance and nothing will be done until this labor question is entirely out of the way.

Statistics compiled by the Lake Superior Iron Ore association show that on March 1 there were 4,530,032 tons of ore on Lake Erie docks against 6,144,423 tons in March 1, 1904. As there were 5,763,399 tons in docks Dec. 1 last, 1,233,367 tons were moved from docks to furnaces during the winter and it is perfectly safe to estimate that at least 1,500,000 tons will be moved before May 1, so that at that time there will be about 3,000,000 tons on docks, against 4,534,103 on the same date in 1904, 3,592,194 in 1903 and 2,348,194 in 1902.

GRAIN SITUATION AT HEAD OF LAKES

Duluth, April 5.—It is said that there are about 1,200,000 bu. wheat at Duluth sold for eastern shipment this spring as well as considerable oats and other grains and flaxseed. One elevator has been selling oats and wheat for immediate shipment, being so crowded that it has been unable to hold more. There will be about 3,800,000 bu. wheat on hand above sales, which is largely contract or special bin, and will be going out slowly during the summer. The total wheat in store here is not enough for ordinary eastern requirements, for milling, and it has been supposed that eastern mill demands would be at least as heavy as usual. This indicates a sharp later demand for all the wheat at the head of the lakes. Indications for the crop of 1905, so far as any indications are of value so soon, are for an excellent crop. The seeding is now going on at the rate of a million acres every three days, and this is two or three weeks earlier than usual, which is of the utmost moment in estimating the possibility of the crop. It is probable that, considering the early date of seeding, more wheat than usual will be put in, and more ground seeded. It is not often that seeding commences on a large scale till well on into April, and about the 15th or 20th of the month is the date figured on by most farmers throughout the wheat region of the northwest. But seeding now is not isolated, but extends clear to the international line, and even in Manitoba they are starting in.

The dates of the opening of Duluth harbor, for the past ten years, has been as follows: 1897, April 18; 1898, April 5; 1899, April 30; 1900, April 19; all the above the steamer H. R. Dixon was the early boat; 1901, April 25, steamer S. B. Barker; 1902, March 30, steamer Hunter; 1903, March 26, steamer C. W. Moore (from Two Harbors); 1904, May 15, steamer America; 1905, March 30, steamer Bon Ami.

LOADING ORE AT DULUTH

Duluth, April 5.—A number of ships will be loading ore in a day or two, and should be on their way east by the close of the week. Ore has been coming to docks for a week, and Monday a few ore trains were put on; previously what had been shipped was on local freights. Some grain will be shipped, a boat or two goes under the spouts today or Tuesday. Stocks of grain have increased during the week, slightly in wheat and, more in oats and the total now at the head of the lakes amounts to 18,258,000 bu.

M. A. Hanna & Co. have been looking about the head of the lakes for a coal dock site and have now selected one, out of two or three options they have held. Their decision has not been announced, will be this week, and is quite likely to be for a portion of the ground close to the Imperial mill, on the east side Rice's point. This is about the most convenient site at the head of the lakes, all things considered, and gives abundant room for a very large dock. How much of a structure is proposed is not known here.

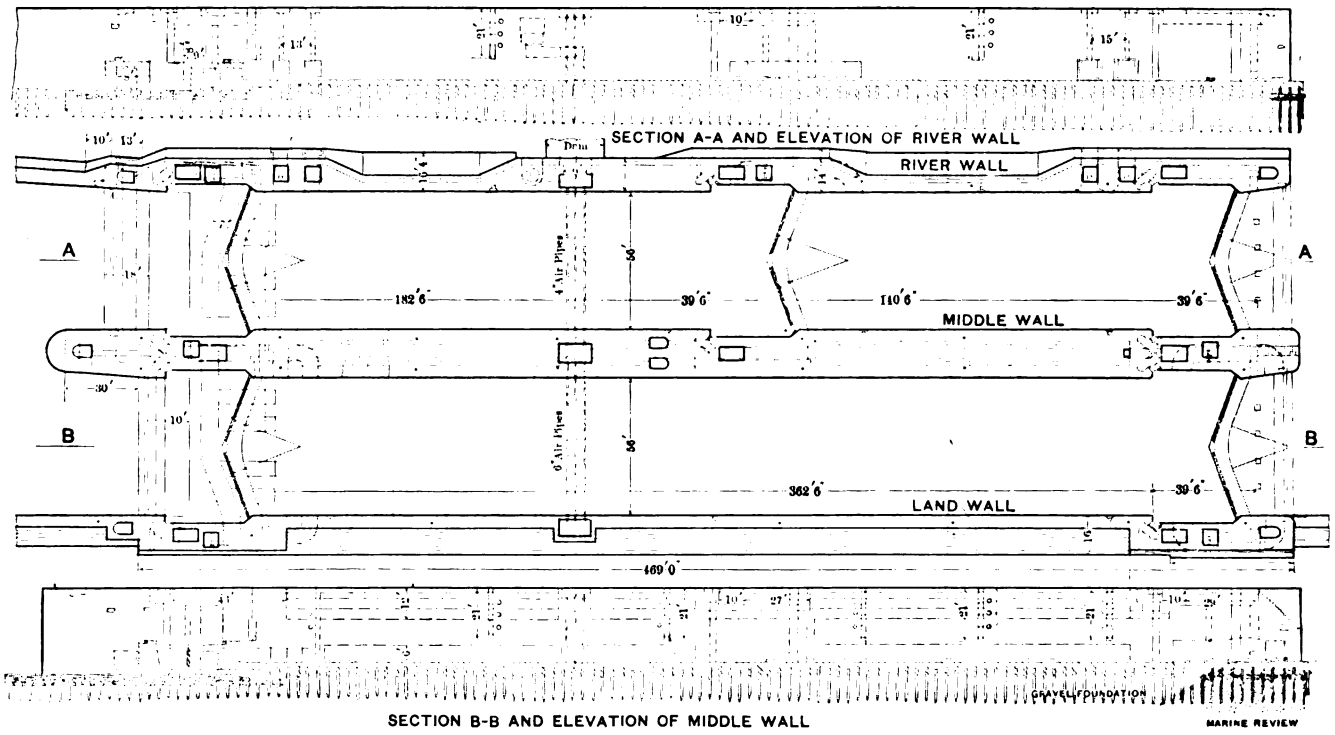
The U. S. Engineer's office at Duluth has opened bids for machinery at the new Superior entry pier work. This includes a steam sand pump, boilers, pumps, etc.

The steamer Jay Gould, of the Lake Michigan and Lake Superior Transportation Co., is being examined for sale, and it is understood that the Peerless and other boats of the same line may also be disposed of. The company is after new vessels for its Chicago-Duluth line.

Capt. Charles Shuttleworth, lumber dealer of Buffalo, has bought from the Delaware & Hudson Co., 855 ft. of land fronting on the Buffalo river and extending from the Ohio street bridge northeasterly to Hamburg street. The river frontage of this property is improved with a great stone dock which cost $140,000 to build. The property is deep and covers several blocks.

Rebuilding Lock and Dam No. 2

To meet the requirements of the constantly increasing traffic of the lower Monongahela river an appropriation was made by the government several years ago to rebuild lock and dam No. 2, whose facilities for several years have been inadequate to meet the needs of the growing shipping at this point. An appropriation of $656,000 was made for the work which was started about a year ago, and it has progressed so favorably that the first lockages are expected to be made in June next year. The lock site is on the right bank of the Monongahela river, about 1,400 ft. below the mouth of Turtle creek, and about 2,800 ft. below existing lock No. 2, at what is known as the rail landing of the Edgar Thomson plant of the Carnegie Steel Co., Braddock, Pa. The lock will have two chambers, each 56 ft. wide, with an available length for boats of 360 ft. The river chamber will have intermediate gates approximately at its middle for locking through such smaller craft as can be handled in this limited space. The locking facilities will exceed that of any other lock on the Monongahela and traffic at this point will be greatly relieved.

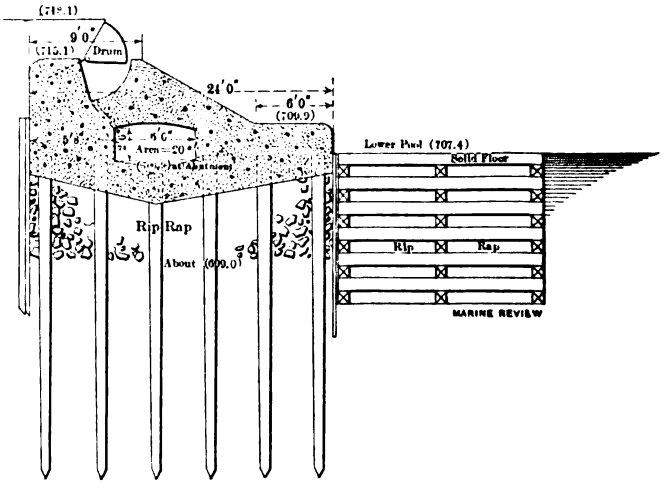


LOCK NO. 2 MONONGAHELA RIVER. GENERAL PLAN AND ELEVATION.

During the year ending June 30, 1924, there were more lockages through existing lock No. 2 than any of the other fifteen locks on the river. The total up and down traffic amounted to 7,420,412 tons, the down coal traffic alone amounting to 6,811,684 tons. The coal that passed lock No. 1 at Pittsburg amounted to only 4,709,740 tons, indicating that nearly 2,000,000 tons were delivered to the iron and steel mills which are located on both sides of the Monongahela between the two locks. During this period the up-stream lockages numbered 9,775 and down 9,457, while the up and down steamers numbered 11,787 and other craft, including coal boats, barges, flats, etc., 34,520.

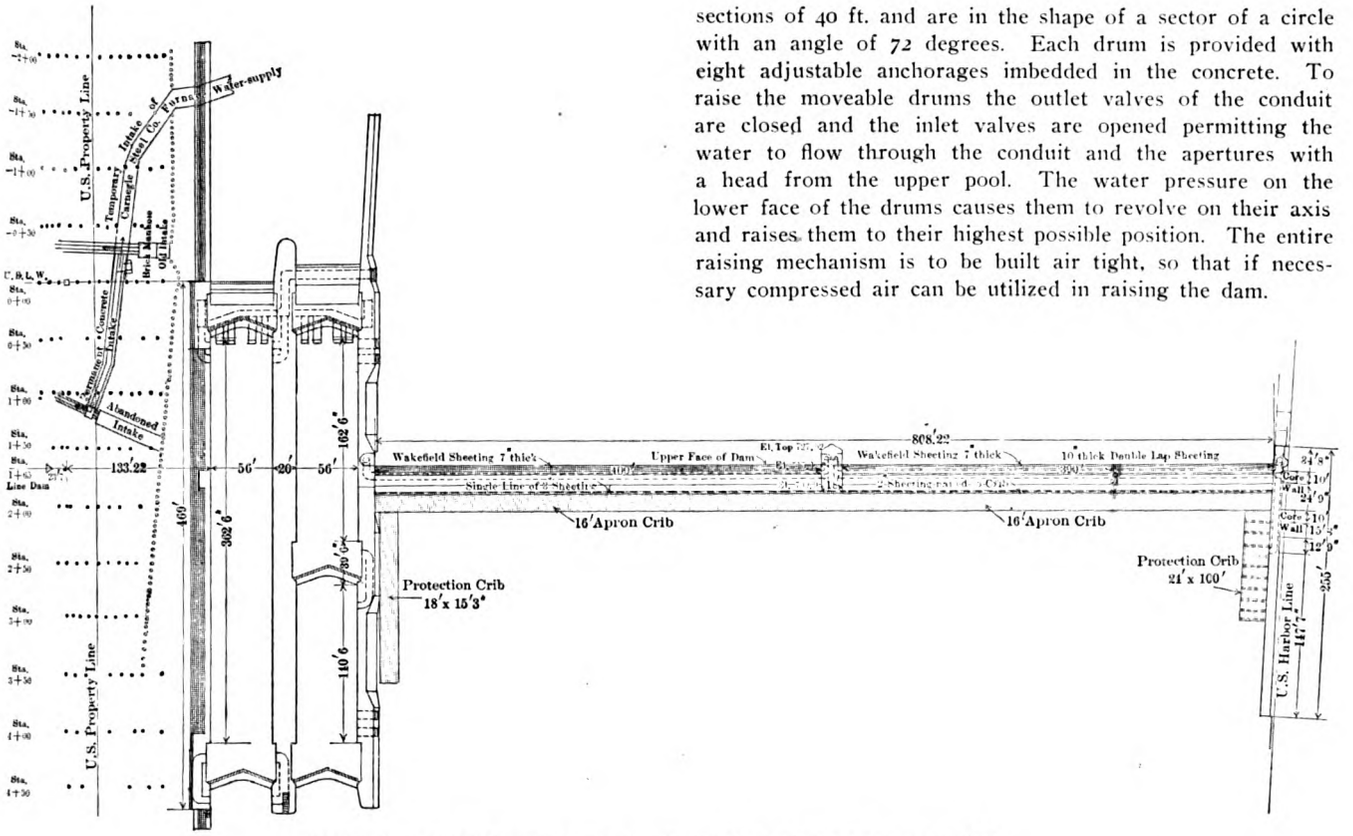
An interesting engineering problem beset the engineers in charge of the work at the outset by reason of the fact that the coffer dam inclosing the proposed lock would include the mouths of two of the most important intakes of the Edgar Thomson steel works and blast furnaces having a combined capacity of approximately 5,000,000 gallons of water an hour. The constant flow of water could not be stopped for the briefest period nor interrupted, and it was necessary to build new intakes around the cofferdam. New conduits were built, half of which were made permanent with concrete work, having an opening 5½ ft. wide and 9 ft. high, and the conduit connections with the intake were made without the slightest interference with the tremendous water supply.

The land and river walls of the lock will be 469 ft. long, while the middle wall will have a length of 522 ft. The dam, a section of which has already been completed, will be



CROSS SECTION MONONGAHELA RIVER DAM NO. 2 AND MOVABLE TOP.

808 ft. long, with an elevation at its crest of 715.25 ft. above sea level, and will be provided with a 3-ft. moveable top of Chittenden drum design. Outside of the drums the dam will be of concrete construction with an extreme width of 24 ft. from its upper to its lower face. It runs level 9 ft. on top.

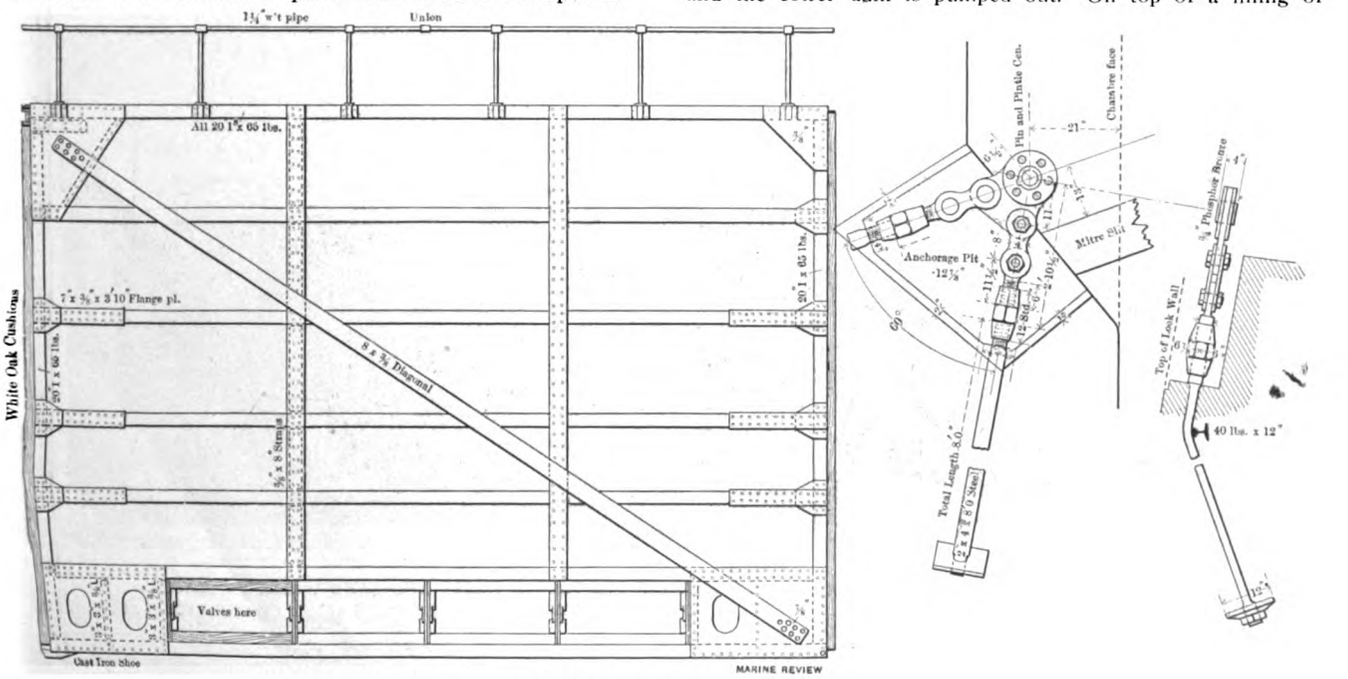


LOCK NO. 2 MONONGAHELA RIVER. GENERAL PLAN OF LOCK AND DAM.

sections of 40 ft. and are in the shape of a sector of a circle with an angle of 72 degrees. Each drum is provided with eight adjustable anchorages imbedded in the concrete. To raise the moveable drums the outlet valves of the conduit are closed and the inlet valves are opened permitting the water to flow through the conduit and the apertures with a head from the upper pool. The water pressure on the lower face of the drums causes them to revolve on their axis and raises them to their highest possible position. The entire raising mechanism is to be built air tight, so that if necessary compressed air can be utilized in raising the dam.

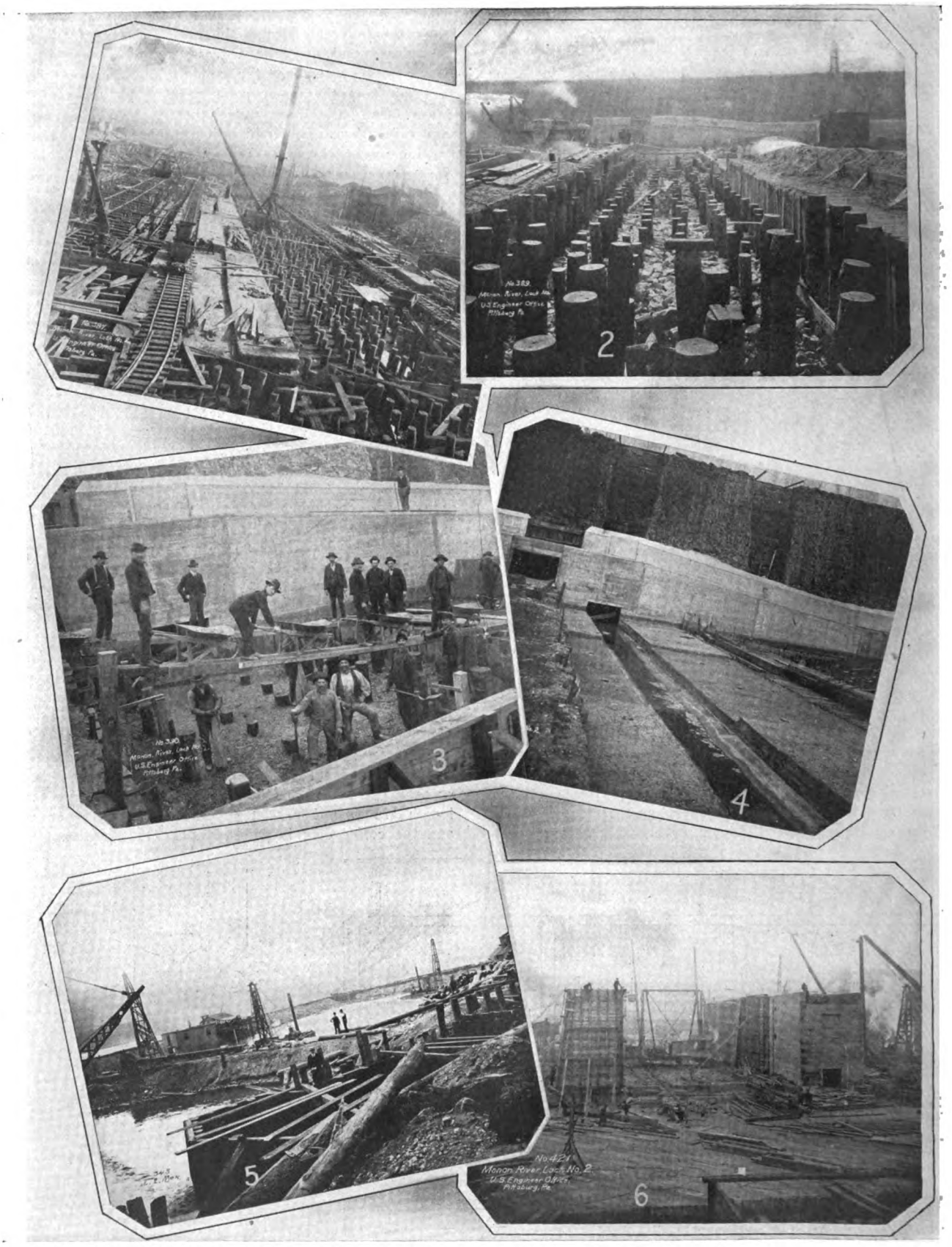
then drops 5 ft. and 2 in. in 9 ft. and runs level a distance of 6 ft. The extreme height from bottom to top of the fixed dam will be 11 ft. Throughout its entire length will run a conduit 6½ by 2½ ft., with slightly arched top, having an area of 20 sq. ft. Through this conduit water will be supplied from the upper pool to raise the moveable drums, the water exerting its pressure against the drums through apertures in the concrete every alternate 3 ft. Four filling valves will be provided for supplying water to the conduit located respectively in one of the abutments, lock, and two in a pier to be built in the center of the dam having a width of 18 ft. The drums will be built of plates and structural shapes in

The dam is constructed in sections 125 ft. long and coffer dams are built to permit the progress of the work. In the construction of the coffer dam a continuous line of Wakefield sheet piles are driven, made of two 2-in. and one 3-in. planks, 18 ft. long, this piling being permanent and affording protection to the dam across the river. On the lower side a 16-ft. apron crib is constructed of 10 by 12-in. timber filled with broken stone and sunk into place. The upper sheet piling and the crib are then banked with a dredge, and the river or open end is bulkheaded with sheet piling. Piles 32 ft. in length are then driven at a distance of 4 ft. from centers and the coffer dam is pumped out. On top of a filling of



GATE AND GATE ANCHORAGE LOCK NO. 2.

Construction Views Lock and Dam No. 2



1.—GENERAL VIEW OF LOCK FOUNDATION WITH PART FOUNDATION FOR MIDDLE WALLS AND LAND WALLS IN PLACE.
2.—DAM FOUNDATION SHOWING PILES CUT OFF AND FOUNDATION PRACTICALLY READY FOR THE PLACING OF CONCRETE. ALSO SHOWS COFFERDAM AS PART OF PERMANENT CONSTRUCTION.
3.—ABUTMENT AND DAM DEPOSITORY, CONCRETE ABOUT PILES, IN FOUNDATION.
4.—SHOWS COMPLETED ABUTMENT AND FOUNDATION OF DAM CARRIED TO ELEV. (708).
5.—COFFERDAM ENCLOSURE FOR LOCK PUMPED DOWN READY TO DRIVE PILES BY "SCOW DRIVERS."
6.—SHOWING FORMS AND COMPLETED SECTIONS OF MIDDLE AND RIVER WALLS.

broken stone, concrete is placed to a depth of 5½ ft., and with this for a foundation the upper portion of the dam is constructed. About 1,400 piles will be used in the erection of the dam.

In the construction of the lock, the entire area was dredged out a depth of 9 ft. and a coffer dam the size of the lock was built. Openings were left in the lower end to permit pile driver boats to enter and the coffer dam was pumped out, sufficient water being permitted to remain so that the pile driver boats could float. Over this entire area, covering 425 by 170 ft., piles were driven 4 ft. apart and under the lock walls at a distance of only 3 ft. About 5,300 piles were used, ranging in lengths from 15 to 22 ft. After the piles were driven the coffer dam was pumped out and the piles cut off to their desired height. Four lines of sheet piling were then driven for the protection of the lock foundations, consisting of three 4-in. planks. The piling was then filled in with broken stone and on top of this the concrete was placed. The lock walls were then built on this bed of concrete as a foundation. The three walls are 30 ft. high, the land wall being stepped with a width of 16 ft. at its base and 5½ ft. on top; the middle wall is 20 feet wide with vertical sides and the river wall has a width of 16 ft. 4 in. at its base and is 7 ft. wide on top. At the gate recesses the walls are 18 ft. wide at the base and 14 ft. on top. As stated before the lock has two chambers each 56 ft. wide and the land and river walls are each 469 ft. long, while the middle wall has a length of 522 ft. The river chamber is to be provided with an intermediate gate for the locking of small craft. The lock walls are already completed.

Miter gates will be provided of steel construction, the upper gates to be 21½ by 30 ft. 9 in. and the lower gates 30 ft. 9 in. by 27½ ft. The gates will have a miter angle of 20 degrees and will weigh approximately 30 tons each. The gates will be operated by chains leading to drums operated by compressed air from the main power house on the river bank, the chains connecting with the bottoms of the gates. Each gate will be opened and closed by one compressed air engine. Ample facilities for filling the locks have been provided and it is estimated that this can be done in about five minutes. The river lock will be filled by two filling conduits through the river wall above the dam 6 by 6 ft. in size and one conduit 7 by 8 ft. which takes in water in the upper gate recess in the river wall and distributes water through four openings each 5 by 6 ft. below the upper miter sill. The land lock will be filled by one conduit through the upper guard wall 7 by 8 ft. in size with four openings through the sill, and one 7 by 8 ft. conduit leading from the gate recess through the land wall to two 6 by 6 ft. openings into the land chamber. For emptying the land chamber two 7 by 8 ft. conduits will take the water from the lower gate recesses around and below the lower gate recesses into the lower pool. The river lock will empty through two 7 by 8 ft. conduits through the river wall into the lower pool. For emptying the intermediate lock in the river chamber one 6 by 6 ft. conduit will be used emptying around the intermediate gate through the river wall into the lower pool.

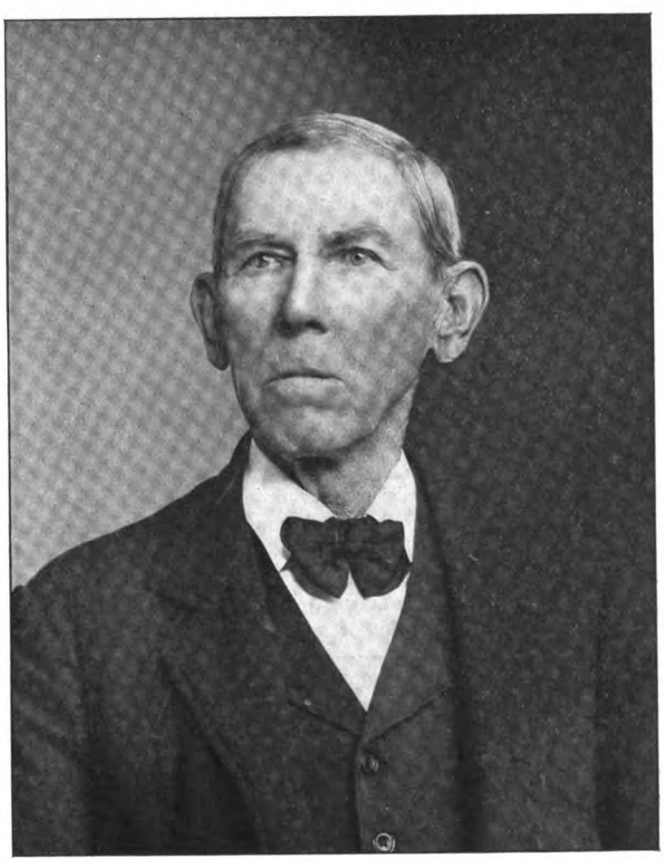
The work is in charge of Major W. L. Sibert, corps of United States engineers with Col. T. P. Roberts as assistant engineer. The field work is in direct charge of John B. Dimmick. The Dravo Contracting Co., Pittsburg, was awarded the contract for erecting the lock and the American Bridge Co. the contract for building the gates, while the construction of the dam is being done by the government by day labor.

Capt. Henry C. McCallum of Detroit has bought the steamer R. J. Hackett and schooner Wm. McGregor from the Vulcan Transportation Co. of Detroit. It is understood that Capt. McGregor will fit out the steamer with deck engine and derricks for handling package freight.

THE FUTURE OF THE OHIO RIVER VALLEY

By John F. Dravo.

The Ohio river ranks as one of the great rivers of the United States, and with its connecting valleys and side streams forms a system of waterways covering and intersecting many thousand square miles of territory rich in the promise of coming population and wealth. Within the domain of these waters are vast mineral deposits and numerous industrial plants demanding corresponding transportation facilities, which at the present time, as in the past, are only available during irregular and limited periods of the year, brought about by the intermitting navigable conditions of the river ranging from flood height to extreme low tides, reducing commercial use to uncertain and limited periods of the year. Transportation, subject to such adverse conditions, must necessarily fail to meet industrial wants and consequently fail to develop prosperous trade conditions. If this great waterway has not measured up to requirements of a possible tonnage, the reason will be found



CAPT. JOHN F. DRAVO.

in the failure of the government to co-operate with nature in utilizing natural forces in the form of great floods sweeping in rushing torrents from mountain to gulf, helpful for a brief period in the movement of commercial tonnage. The construction of the Panama canal will create such an imperious demand for the connection of inland carriage with ocean highways as to insure the necessary appropriations for the completion of a system of reliable water tonnage shipments from headwaters to the Gulf of Mexico, ample enough to meet the commercial wants of the great valleys.

The demand for the products of mill and mine in the Mississippi valley and the limited time of possible delivery resulted in the development of a system of water carriage outclassing all other forms for capacity and cheapness on land, sea or ocean, known as the towing system, which consists of a number of loaded crafts hitched in compact forms to

a steamer for delivery at points of consumption. The limitations of this system of water carriage are those imposed by long periods of non-navigable conditions, compelling suspension of shipments. The great iron and steel steamer Sprague has the capacity on a single trip to deliver at New Orleans a million and a half bushels of coal at a cost of carriage rate that would bankrupt the richest rail corporation in existence. Continuous navigation in the use of the towing system would for all time to come make freight congestion on our rivers impossible and so reduce the cost of carriage as to hush forever the cry for cheap transportation. The hindrance to the successful inauguration of the towing system is the shortage of adequate water supply which so disastrously limits shipping conditions frequent to two or three months per year. These frequent and long suspensions of shipments seriously impair the value of investments in mines, mine equipment, steamers, coal shafts, coal crafts, etc. To overcome such adverse conditions the national government has undertaken the construction of a series of locks and dams from Pittsburg to Cairo, a distance of 1,000 miles, providing for a channel depth of 9 ft. and extending shipping conditions so as to meet the demands of consumers.

The benefits of the lock and dam system in securing continuous navigable conditions is conclusively demonstrated by the growth of industrial interests in the Monongahela valley. In 1838 and 1840 locks and dams No. 1 and 2 were completed and subsequently extended to the state line, a distance of some 90 miles. In 1844 600,000 bu. of coal passed through the completed locks 1 and 2, increasing from year to year the amount of coal passing through the locks until the annual amount exceeds 200,000,000 bu., while the growth of industrial plants line the shores from Pittsburg to Brownsville, including some of the largest in the world, producing over 70,000,000 yearly tonnage, exceeding the tonnage of London or New York. No such limited area of river and valley on the globe can furnish a parallel of industrial growth and activity, made possible by the facilities of reliable continuous navigation. When like shipping conditions prevail on the Ohio and Mississippi rivers extending continuously from Pittsburg to the gulf and connecting with the Panama canal, the Ohio river valley will become what the late Senator Conkling predicted, the workshop of the world. Surely every intelligent and patriotic American citizen will joyously welcome an event of such far reaching significance.

OHIO VALLEY IMPROVEMENT ASSOCIATION

The Ohio Valley Improvement association was organized in October, 1895, under the auspices of the Cincinnati Chamber of Commerce, which body made the first movement towards the organization of a permanent association having for its purpose the improvement of the Ohio river to the end that it be navigable the entire year. The first convention was attended by delegates coming from points along the Ohio from Pittsburg to Cincinnati inclusive and from many of the thirteen tributaries of the river. Every year since its organization conventions have been held as follows: Pittsburg, Evansville, Wheeling, Louisville, Cincinnati, Paducah, Parkersburg, Evansville, Huntington and this year the convention will be held at Cairo, Ill. The interest in the association has been growing year by year and the character of the delegates has largely changed. Whereas in the beginning the delegates were largely composed of river men representing exclusively river interests, they are now, and for some years past, have been composed mostly of representatives of the manufacturing, mining and commercial interests of the towns in the entire valley that will be benefited by this great improvement. The organization embraces the representation of 13,000,000 people and the river and its tributaries draw water from fourteen states and the commerce of the river affects to a greater or less extent twenty-six states of the union

Col. John L. Vance was elected temporary chairman of the meeting the result of which was this association and was elected permanent chairman, which position he has since held. His headquarters are at Columbus, although the headquarters of the association are at Cincinnati, where the secretary and treasurer, J. F. Ellison, is located. The vice president of the association are as follows:

Pennsylvania: Geo. H. Anderson, W. B. Rodgers and Jas. A. Henderson, Pittsburg.

West Virginia: H. Quarrier, Wheeling; D. A. Mossman, Huntington; B. W. Peterson, Wheeling, and J. B. Finley, Parkersburg.

Ohio: Albert Bettinger, Cincinnati; H. A. Marting, Ironton; D. J. Sinclair, Steubenville.

Kentucky: W. W. White, Louisville; W. A. Patton, Catlettsburg; S. A. Fowler, Paducah.

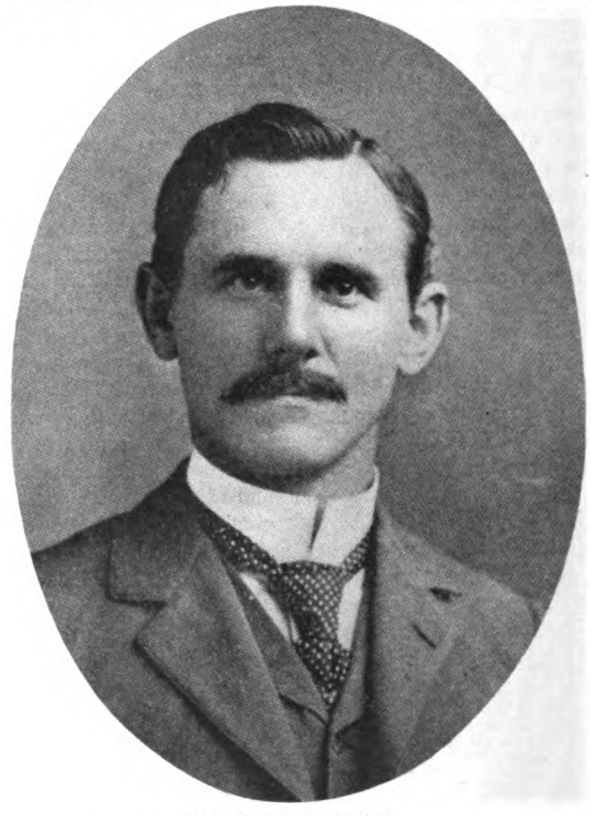
Indiana: F. B. Posey, Evansville; M. C. Barber, Madison; Chas. Hegewald, New Albany.

Illinois: Geo. Parsons, Cairo; J. C. Willis, Metropolis; E. A. Smith, Cairo.

Executive finance committee: Col. John L. Vance, Geo. Puchta, O. F. Barrett, Paris C. Brown, J. F. Ellison, Albert Bettinger, E. C. Gibbs and R. W. Wise.

MR. JOHN H. JONES

John H. Jones, president of the Pittsburg-Buffalo Co., has had an active career as a river shipper of Pittsburg coal. He was born at Greenock, Allegheny county, Pa., Oct. 7, 1866, and at the age of thirteen left school to take charge of the loading and shipping of coal from his father's mines. In 1889 he was made secretary, treasurer and general manager of the Catsburg Coal Co., Ltd., and soon went into business on his own behalf, buying a half interest in the steamer Pierpont and



MR. JOHN H. JONES.

a number of barges, shipping coal to Cincinnati and New Orleans. He also secured half interest in the Rostraver Coal Co., and an interest in the Ivill and Catsburg Coal Co. and was made general sales agent for all these concerns. In 1896 the firm of James Jones & Sons was formed absorbing the shipping, towing and retail business owned by John H. Jones. In October, 1899, the numerous Jones interests were sold to the Monongahela River Consolidated Coal & Coke Co. and Mr. Jones was elected one of the directors. Upon the organization of the Pittsburg-Buffalo Co., he was elected president.

VICTORIAN CROSSES THE ATLANTIC

The Allan liner Victorian, the first Atlantic liner to be equipped with turbines, reached Halifax this week after a successful passage from Liverpool. No attempt was made to push the vessel, the steamer crossing in the ordinary time but with marked absence of vibration and, therefore, greater comfort for the passengers. The highest speed made was about 16 knots and the average about 14.

A striking difference is presented between the engine room of the Victorian and that of any other large steamship. In place of the complex structure of cylinders, piston rods and cranks revolving with imposing pulsations, we see only the upper halves of three huge horizontal iron cylinders, 7 ft. in diameter and about twice that length. The steam generated in eight double-ended boilers passes into the engine room through large pipes. It is first of all turned into the high pressure turbine, which is between the low pressure turbines, for the Victorian is a triple-screw ship. The engines are of 15,000 I. H. P., and the pressure at the point where the steam enters is 180 lbs. to the sq. in.

If we were to open out the high pressure turbine in sections we should see the inside grooved like the nut of a screw bolt, the groove becoming wider and deeper from the end where the steam is turned in to that at which it passes out. The groove to begin with is about an inch in depth and rather more than an inch in width; to end with the groove is nearly six inches in depth and three in width. And in the low pressure turbines the groove at the starting end is of the same size and depth as at the exit point of the high pressure cylinder, while at the point where the steam finally issues as exhaust the groove is a foot in depth and of corresponding width. But in this endless groove are set transversely at close intervals a multitude of small blades. These are of the same depth, and not quite half the width of the groove; are put close up to the edge on one side and leave a space on the other. The look of the thing is not unlike the gills of an immense fish. The end of the propeller shaft, enlarged for the sake of leverage, fits exactly the inside of the cylinder. Round this enlarged shaft head are set what appears like a screw thread, which is found, however, to consist of innumerable small blades not unlike the blades of a propeller. In the engines of the Victorian these blades number 750,000.

These blades fit into and revolve in the space left in the grooves by the blades in the "gills," so that when the blade in the shaft and the blade in the groove are in line they quite fill the passage. Now when the steam enters the groove it cannot get past without forcing the blade on the propeller shaft out of the way. In doing so it finds itself similarly locked in the next tiny compartment, and the process is repeated. The result is that the steam struggles through the grooves in what may be called a state of acute torture, driving the propeller blades before it. The process is one of inconceivable rapidity, for the propeller shafts of the Victorian make 220 complete revolutions per minute; revolving, that is to say, four times as fast as the ordinary marine reciprocating engine.

The chief difficulty in the construction of the marine turbine is one of finish and measurement. The blades have to be graduated in size with mathematical nicety and placed with mathematical accuracy. They have to be shaped and fitted with great skill, and fixed solidly. A loose blade would bring the whole affair to grief. But at the workshops of Workman, Clark & Co., Ltd., Belfast, by whom the Victorian was built, the fittings were subjected to severe tests. A pressure of one ton applied to the smallest blades, failed to affect them in the least. It is manifest that between a ton and a pressure of 180 lbs. the co-efficient of safety is enormous. These being the first turbine engines turned out by Workman, Clark & Co., their successful construction is looked upon as no slight feat. The sister ship and engines are now being built by Messrs. Stephen on the Clyde.

The controlling gear is fitted on to the inlet steam pipes, and apart from this, there are on the main engines no wheels or levers of any kind. All the working parts are enclosed. The lubrication of the bearings is done by an oil pump working automatically. The oil is first forced through a cooler, and from that pumped through the working parts, returning to the reservoir at the end of the circulation. In this way the parts run in oil, and the staff of greasers needed is considerable.

The propeller shaft bearings are kept cool by jets of water, and the turbines themselves are encased in heat-resisting material a foot thick, so that the outside cases are quite cool to the touch. When the engines are reversed the high-pressure turbine which operates the central shaft is shut off, and the steam forced through the low-pressures the reverse way. This can be done, because the low-pressures then receive the full force of the steam. It should be added that in steaming ahead the power after passing through the high-pressure cylinder is divided and carried back to fed the low-pressures in equal proportions.

Owing to their high rate of velocity, the screws of the Victorian are only 8 ft. in diameter, the blades being 3 ft. in length. All are of the same size. The propeller shafts, of wrought steel, are in consequence of less than ordinary dimensions, which saves both weight and cost. The parts have been turned with great exactitude to ensure the shafts being perfectly straight. Should it be deemed advisable to increase still further the ship's speed, either finer propeller blades or larger propellers will achieve that result. This, however, is a matter dependent on experience. On board the Victorian the usual pulsation of a ship's engines is reduced to a scarcely perceptible tremor, and the heat of the ordinary engines is replaced by a humming, rather soothing than disagreeable. The engines being enclosed, the engine room is quite free from all odor of hot oil. These things add so much to the comfort of the ship that the sensation is quite novel. She seems in traveling to glide through the water under the influence of some hidden power.

The Victorian is not only the largest, but by far the most commodious, of the ships which the owners of the Allan Line have yet built. Her fittings and decorations are in the improved taste noticed in new ships of other companies—comfort everywhere being preferred to show. She has accommodations for 250 first, 350 second and 1,000 third class passengers. The first class dining saloon, fitted with oak, relieved by panellings of silk tapestry and paintings, is solid and elegant without being grandiose. It extends the full width of the ship, which is of ample beam to insure her being a good sea boat, and the thorough ventilation is further improved by an octagonal dome, decorated with colored glass. The second class dining saloon, of equal dimensions and similar plan, presents a corresponding scheme of decoration. It is equal to the first class in older ships.

The new Isthmian Canal Commission has been constituted as follows: Theodore P. Shontz, chairman; Charles E. Magoon, governor of canal zone; John F. Wallace, chief engineer; Rear Admiral M. T. Endicott, U. S. Navy; Brigadier General Peter C. Haines, U. S. Army; Col. Oswald H. Ernst, corps of engineers, U. S. A.; Mr. Benjamin M. Harrod. The members of the commission are to receive a salary of $7,500 per annum each with an extra allowance of $22,500 for the chairman, $17,500 for the chief engineer and $10,000 for the governor of the zone. The head of each department is allowed the use of a furnished house on the isthmus and his traveling expenses.

AROUND THE GREAT LAKES

It is figured that about four more years will be required to complete the new ship canal at the West Neebish passage, St. Mary's river.

The White Star Line steamer Owana made her first run of the season to Algonac from Detroit on Sunday last. Over 500 persons were aboard.

Michael Ryan, formerly chief engineer of the Union Towing & Wrecking Co., has accepted a position as chief engineer of a mine at Anaconda, Mont.

The car ferry Pere Marquette No. 16 has opened the season of navigation at Conneaut by making its first trip across the lake to Port Stanley with a cargo of coal.

The Farrar Transportation Co., Collingwood, Ont., declared a dividend of 10 per cent for the year of 1904 and decided to purchase a second steamer of full canal size.

An agreement between the Longshoermen's association and the package freight lines at the port of Cleveland was entered into last week. The wage schedule remains the same as last year.

The damage caused by fire at the plant of the Buffalo Dry Dock Co. was exaggerated in the newspapers. Much machinery was saved and the dock is capable of taking care of its work.

The steamer J. Emory Owen which was burned at Milwaukee and which was purchased by Capt. W. H. Strong has been renamed the Fred E. Meyers. She will be placed in the lumber trade.

William Mott, custodian of the St. Clair Flats ship canal, has been removed by Lieut. Col. Davis, United States engineer in charge of the district, and Horace Smith of Monroe, Mich. has been appointed in his place.

The steamer China, formerly operated by the Anchor Line of Buffalo will run this season between Cleveland, Toledo and Montreal in the service of G. A. Jaques & Co. of Montreal. The steamer will have new boilers and a new fore and aft engine.

The steamer E. H. Gary, building for the Pittsburg Steamship Co., will be launched from the Chicago yard of the American Ship Building Co. on Saturday afternoon. She will be the first of the quartet building for this company to go overboard.

The Anchor Line will occupy the Pennsylvania Co.'s pier front on Water street, Cleveland, hereafter. This pier is easily accessible to teams and large warehouses thereon, affords ample room and facilities to expedite the handling of freight to and from wagons.

The Ottawa Transportation Co. is building at its Hull, Quebec, yard, two barges each 120 ft. long, 24 ft. beam and 9 ft. deep. They are intended for the company's trade between Ottawa and Montreal. The company's fleet this year will consist of five tugs and sixty-four barges.

The Marine Passenger, Freight and Steamer Cooks' union have decided to return their charters to the International Longshoremen, Marine & Transport Workers' association on the ground that the International association is unable to help them in making contracts with vessel owners.

The Marine Transportation Co. of Ogdensburg has been incorporated under the laws of New York to operate steamers on the great lakes and on the St. Lawrence river from Ogdensburg, N. Y., to Prescott, Ont. The directors include G. L. Ryer of Ogdensburg and H. J. Bartlett of Orillia, Ont.

The department of marine and fisheries of Canada has purchased the steel steamer Seguin from the Parry Sound Lumber Co. and will use her as a lighthouse supply boat. A cabin will be built from the stern to the bow to about two-thirds of her length. Her fore deck will be fitted with a clam to handle the gas buoys.

The Canadian Ore Dock Co. has been incorporated with a capital of $500,000 a week ago at Toronto to construct docks and wharves at Port Arthur, Ont. The company is being organized in connection with the blast furnaces which it is proposed to construct at Port Arthur in which Mackenzie, Mann & Co. are interested.

The Erie Transportation Co. has been organized to conduct a passenger service between Buffalo and Erie. The Urania has been purchased to be put on the run and has been renamed Keystone. The Buffalo men interested in the company are John F. Patterson, David J. Nelligan, Daniel Mahoney and Sons, J. E. Conlan, Jr., and Willis Brown.

Navigation was opened between Cleveland and Detroit on Monday of this week by the arrival of the City of Detroit from Detroit. This is two days earlier than last year when navigation was opened on April 5. Capt. A. J. McKay, master of the City of Detroit, said that very little ice was encountered. Daily service has now been resumed for the balance of the season.

The bill to incorporate the Georgian Bay Land & Ship Railway Corporation, also known as the Canadian Canals Corporation was unanimously killed by the railway committee of parliament at Ottawa. The plan of the corporation was to build a continued canal and ship railway from some point on Georgian Bay to some point on Lake Ontario, making use of Lake Simcoe.

The Cleveland office of the Standard Oil Co. of New York, marine department, has been closed. Mr. H. A. Drury, who has been on the great lakes for the past two years, has gone to Hamburg, Germany, in the interests of the marine department of the company, and Mr F. W. Jackson has charge of the marine business at Cleveland with desk room at the Upson-Walton Co.

The Montreal & Lake Erie Steamship Co. has been incorporated with a capital of $180,000 with offices at Toronto to carry on a general navigation business, wreckage and salvage operations and to construct wharves. The provisional directors are: James Carruthers, C. A. Jaques, Montreal; J. H. Hall, Ottawa; W. D. Matthews, F. P. Benjamin, S. Samuel, C. W. Bond and George Summerville, Toronto.

Last season the Collector of Customs of Toledo fined Zepp Bros. $200 for navigating a naphtha launch without signal lamps. An appeal was made to Secretary Metcalf of the department of commerce and labor to have the fine remitted, but he declined to do so on the ground that a display of running lights by vessels under way is a fundamental provision of law for the security of life and property.

President Walsh of the Licensed Tugmen's association has made contract with the sand dredge owners of Sandusky and Toledo. On all boats over 200 tons captains and engineers are to get $120 per month and board, and on all boats under 200 tons $110 per month and board. Twelve hours is to constitute a day's work and all grievances are to be settled by arbitration, the crews remaining at work meanwhile.

The winter steamer Minto & Stanley operating between Pictou, N. S., and Georgetown, P. E. I., were unable to leave port for over a month prior to March 3, on which date they got within two miles of each other, a heavy ice field lying in between. The Stanley's passengers and freight were transferred across the ice to the Minto and so reached Pictou. Service was maintained in this way for some days until the steamers were frozen in.

Capt. C. H. Westcott, supervising inspector for the eighth district, has just filed his annual report. The most interesting part of it is that which deals with the passenger traffic. Of the 10,224,195 passengers carried, Detroit has 7,207,241, Chicago 734,265, Milwaukee 343,717, Grand Haven 844,504, Marquette 268,528 and Port Huron 685,850. These figures for Detroit and Port Huron of course include the enormous crowds carried daily by the excursion ferry steamers.

CAPT. MITCHELL ORDERS THIRD STEAMER

Capt. John Mitchell has placed an order for a third steamer for 1906 delivery. Unlike the two preceding orders she is to be a moderate sized freighter, having a carrying capacity of 6,500 tons. She will be 436 ft. over all, 416 ft. keel, 50 ft. beam and 28 ft. deep. Her engines will be triple-expansion with cylinders 21, 33½ and 57 in. diameters by 42 in. stroke, supplied with steam from two Scotch boilers 12 ft. by 12 ft., fitted with Ellis & Eaves' draft. She will have twelve hatches spaced 24-ft. centers, being 12 ft. wide fore and aft. The new steamer will be built at the Cleveland yard. This is the sixth steamer that the American Ship Building Co. is to build for 1906 delivery.

LAUNCH OF THE L. C. HANNA

The steamer L. C. Hanna was launched from the Cleveland yard of the American Ship Building Co. on Tuesday of this week and was named by Mrs. Dan R. Hanna. Owing to the absence of Mr. and Mrs. L. C. Hanna and Mr. Dan R. Hanna the attendance was light. On the launching stand with Mrs. Hanna were Mr. and Mrs. Belden Seymour, Mrs. McMurray, Mr. R. L. Ireland, Mr. James C. Wallace, Mr. R. E. Wetmore, Mr. Robert Logan, Mr. John S. Ashley, Capt. Chas. L. Hutchinson, Mr. Walter H. McGean, Mr. Arthur Hawgood, Mr. Harry Hawgood, Mr. John Kelley, Capt. Frank Brown and Mr. I. J. Inglish of Youngstown. The Hanna is 524 ft. over all, 504 ft. keel, 54 ft. beam and 30 ft. deep. She will have triple expansion engines with cylinders 23½, 38 and 63 in. by 42 in. stroke. Steam will be supplied by two Scotch boilers, 14½ by 11½ ft., fitted with Ellis & Eaves' draft. The steamer will be completed early in May and will be commanded by Capt. Edward Sullivan.

DEPTH OF WATER AT LAKE ERIE PORTS

While no direct surveys have been made of the Lake Erie harbors, the government engineers' department does not believe that any less stages of water obtains at any of the ports with the exception of Ashtabula where a shoal has formed. All the other ports are fairly free of filling. At Ashtabula, however, a dangerous bar has formed across the channel beyond the jetties. The crest of the bar is about 500 ft. out of the outer extremity of the jetty and the bar is not less than 300 ft. wide. There is a draught of 18 ft. at mean lake level across the bar, but this depth must be reduced a foot and a half because the lake is now that much below the standard depth. The government dredge Burton has been ordered to Ashtabula and Major Kingman hopes to have the bar removed before navigation is opened.

APPOINTMENTS OF MASTERS AND ENGINEERS

Hines Lumber Co., Edward, Chicago, Ill.: Steamers—L. Edward Hines, Capt. James Carr, Engineer Christian Smith; L. L. Barth, Capt. D. R. Parsons, Engineer Charles Jubinville; Gertrude R. Wiehe, Capt. George D. Ryan, Engineer Frank Nold; Oscoda, Capt. Wm. McGannon, Engineer Charles McAvoy; Cormorant, Capt. M. McKenzie, Engineer Theodore Swinker; Louis Pahlow, Capt. W. J. McKay; Engineer C. A. Perry; I. W. Stephenson, Capt. Dane Wall, Engineer Joseph Nold; W. H. Sawyer, Capt. M. Canartney, Engineer Rueben Ellis. Schooners—Wayne, Capt. Eli Jacques; S. E. Marvin, Capt. Fred Anderson; Nirvana, Capt. John Hudson; Galatea, Capt. Alfred Germain; Alice B. Norris, Capt. Horace Acree; Helvetia, Capt. J. Jennings; D. L. Filer, Capt. Joseph D. Rose; Ida Corning, Capt. P. H. Edgar; Delta, Capt. John Bates; City of Chicago, Capt. Wm. Rose.

J. H. Sheadle, mgr., Cleveland-Cliffs Iron Co., Cleveland, O.: Steamers—Wm. G. Mather, (building), Capt. John M. Johnston, Engineer Thomas Durkin; Pontiac, Capt. Thomas E. Murray, Engineer Wm. Naylon; Frontenac, Capt. C. A. Anderson, Engineer J. B. Hart; Cadillac, Capt. Wm. H. Hoffman, Engineer R. W. Fink; Choctaw, Capt. F. D. Perew, Engineer Thomas J. Rees; Andaste, Capt. U. S. Cody, Engineer J. F. Kalb; Pioneer, Capt. C. R. Ney, Engineer C. B Keeler; Falcon, Capt. E. H. Bennett, Engineer W. B. Rowe: Schooner—Chattanooga, Capt. Thomas Kimmitt.

Lake Sand & Gravel Co., R. E. Doville, secy., Toledo, O.; Steamers—Walter D, Capt. James B. Warner, Engineer Joseph Sayen; Laura D, Capt. John Cunningham, Engineer James Shepler; Commerce, Capt. Edward McNutt, Engineer Wm. McKinley; Ella G., Capt. David F. Doville, Engineer John Fletcher; Syracuse, Capt. John Mulinix, Engineer Jacob Mulinix; D. Dussault, Capt. John Moesing, Engineer Valentine Felder; R. E. Doville, Capt. Frank Lamb, Engineer DeWitt Fields.

Rutland Transit Co., Ogdensburg, N. Y.: Steamers—J. R. Langdon, Capt. Harvey Brown, Engineer Charles M. Cotter; H. R. Adams, Capt. ———, Engineer A. J. Kinch; A. McVittie, Capt. Thomas Hough, Engineer W. J. Brown; Gov. Smith, Capt. W. S. Shay, Engineer L. O. Willix; F. H. Prince, Capt. E. B. Shay, Engineer John Alexander; W. A. Haskell, Capt. W. H. Plumb, Engineer H. Goodheart; Wm. J. Averell, Capt. John Smith, Engineer Frank Doyle.

Blodgett, O. W., Bay City, Mich.: Steamers—Zillah, Capt. Hugh McKenzie, Engineer James Speir; C. H. Bradley, Capt. James Bennett, Engineer R. C. Speir; Myron, Capt. Henry S. Shackett, Engineer N. P. Slater. Schooners—Mary Woolson, Capt. John Gordon; Brightie, Capt. L. D. Bennett; Peshtigo, Capt. F. Dettman; Goshawk, Capt. John Gordon; Delaware, Capt. Wm. R. Young; Nellie Redington, Capt. Wm. Keenan; Ogarita, Capt. E. S. Keenan.

J. H. Sheadle, mgr., Presque Isle Transportation Co., Cleveland, O.: Steamers—Presque Isle, Capt. H. H. Parsons, Engineer Fred Schwartz; Angeline, Capt. S. A. Lyons, Engineer C. H. Menmuir; Peter White (building), Capt. S. N. Murphy, Engineer Fred D. Philp.

C. O. Jenkins, mgr., Mack Steamship Co., Cleveland, O.: Steamers—Wm. H. Mack, Capt. R. E. Byrns, Engineer C. J. Church; F. B. Squire, Capt. Wm. Smith, Engineer Wallace Tomey.

C. O. Jenkins, mgr., The Ohio Steamship Co., Cleveland, O.: Steamer—James P. Walsh, Capt. A. J. Greenley, Engineer Wm. H. Kennedy.

J. H. Sheadle, mgr., St. Clair Steamship Co., Cleveland, O.: Steamer—Kaliyuga, Capt. F. L. Tonkin, Engineer Charles A. Sharpe.

J. H. Sheadle, mgr., Hopkins Steamboat Co., Cleveland, O.: Steamer—Centurion, Capt. C. E. Sayre, Engineer Thomas B. Kelley.

Green Bay Vessel Co., Green Bay, Wis.: Steamer—Orion, Capt. G. H. Scott, Engineer C. W. Adler.

OBITUARY

Capt. Wm. Osborn of Duluth is dead of bright's disease. He was 58 years old and leaves a large family. Capt. Osborn has been made very well off the past few years by a sand-sucking device which he invented and has since used. It has made him a great deal of money, far more than is generally supposed. Capt. Osborn was a Canadian by birth, but went to Bay City when a lad, and came to Duluth many years ago.

Capt. John Sinclair, for over thirty years keeper at various stations on the great lakes, died at his home in Detroit on Friday last. He was born on one of the Shetland islands in 1829 and came to the United States with his parents in 1840. He had sailed since boyhood but in 1886 entered the light-house serivce.

Capt. Edward McNelly, harbor master of Toledo, died in that city this week. He was one of the best known vessel masters on the lakes.

MR. W. W. SMITH

Mr. W. W. Smith, marine representative of the marine department of the Standard Oil Co. of New York on the great lakes, was located at Duluth in 1903 and at the Sault in 1904. His many friends may this season meet Mr. Smith at any port from Duluth to Buffalo, and if there is any one that does not already know that Vacuum 600 W. Cylinder Oil, Vacuum

MR. W. W. SMITH

No. 1 Marine Engine Oil and Vacuum Anti-friction Grease are not the best lubricants known for marine purposes, he will be only too pleased to take a day off and convince them.

ITEMS OF GENERAL INTEREST

The protected cruiser St. Louis will be launched from the ship yard of the Neafie & Levy Ship & Engine Building Co., Philadelphia, May 6.

Rear Admiral A. S. Barker, commander-in-chief of the North Atlantic fleet, retired last week on account of age. He will be succeeded by Rear Admiral Robley D. Evans.

The Hamburg-American Line announces that a regular fortnightly freight and passenger service has been established between New York and Colon. The first steamer to sail was the Valdivia.

The Bridgeport Motor Co., Bridgeport, Conn., has shipped to the Adirondack League club, McKeevers, New York, a motor boat 24 ft. long, 7 ft. beam and 28 in. draught with a 8-H. P. gasoline motor.

The torpedo boat flotilla was sent out on Narragansett bay to test the new 21-in. Whitehead torpedoes recently introduced in the navy. The torpedoes attained a speed of 32 knots over a range of 2,500 yards.

Wilson Bros., Astoria, Ore., have been awarded a contract to build a launch for the Fishermen's Co-operative Packing Co. The dimensions of the craft will be as follows: Length, 50 ft., beam 11 ft. 5 in., depth 3 ft. 5 in.

The tug boat Edwin Brandow built by Brown & Sons, Staten Island, N. Y., for Capt. Edwin Brandow was launched last week. The tug is intended for harbor work, principally for attending the Ward, Mallory & Maine Steamship Co.'s steamships and barges.

The Noecker, Rickesbach & Ake Ship Building Co., Camden, N. J., announces that they intend to build a large dry dock and also machine shop. The company already has four small floating dry docks from 130 to 185 ft. in length and was recently incorporated with a capital of $145,000.

The port engine of the torpedo boat O'Brien was put out of commission by the breaking of the high pressure piston rod on her preliminary trial trip off Fire Island last Tuesday. W. E. Van Sickle, the chief machinist, though submitted to great personal danger succeeded in cutting off the steam before the broken piston had knocked a hole in the torpedo's sides.

Except on rare occasions when a war vessel visits Egyptian waters, the United States flag is never seen among the 1,500 steam and 2,000 sailing vessels that clear from Alexandria, Egypt, annually. The balance of trade always has been and always will be against the United States under these circumstances. American manufactures intended for Egyptian consumption have to be transhipped at Liverpool.

James Stewart & Co. of Pittsburg, Pa., have received contracts for rebuilding the extensive Stuyvesant docks at New Orleans which were recently destroyed by fire. The new Stuyvesant docks will consist of 4,500 ft. of concrete and steel walls built upon creosoted piling and covered with one-story fire-proof buildings with concrete roofs. There will also be two freight warehouses of steel 1,200 ft. long and one-story high. One cotton warehouse 1,800 ft. long will also be erected. The contract for the steel has been awarded to the American Bridge Co.

Several tests have recently been made with solid petroleum for torpedo boats and in a number of instances has been attended with success. On March 23 at the torpedo boat station at Newport, R. I., a test was made on the torpedo boat McKee. Her boilers were filled with cold water and steam was made in nine minutes. The test was made by the boat's crew, the inventors being merely spectators. The fuel is prepared in small bars and is compact for carriage and withstands the extremes of heat and cold. It is understood that it has been adopted by the Swedish navy.

Work has been begun on the new dry dock that is to be constructed at the Brooklyn navy yard, New York, the contract for which was awarded to G. B. Spearin, representing Spearin & Preston. The company has established an office at the navy yard and all the buying and other business connected with the building of the dock will be transacted there. The contractors have purchased two Lidgerwood cableways from the Lidgerwood Mfg. Co., New York, and three 125-H. P. locomotive boilers from James Beggs & Co., New York. The contractors are also in the market for a centrifugal pump and probably for steam hammers as well. Those in charge of the work are Samuel L. Waller, superintendent; James Garnett Vassinger, engineer-in-chief; Caleb Hyatt, assistant engineer, and August Siegle, Jr., mechanical engineer.

The Wellman-Seaver-Morgan Co., with main office and works at Cleveland, announces that Mr. Geo. B. Damon, who has been manager of their New York office, has been transferred to an important position in connection with the engineering and sales department at Cleveland, and that Mr. W. A. Stadelman, for the past ten years manager of the eastern office of The Brown Hoisting Machinery Co. has become the manager of the general eastern office of the Wellman-Seaver-Morgan Co., with offices at No. 42 Broadway, New York city. Mr. Stadelman is well and widely known from his connection with The Sprague Electric & Railway Motor Co.; as chief engineer of The Equitable Electric Railway Construction Co.; general manager of The Bristol Pelt Line Railway Co., and latterly in his connection with the Brown company. All inquiries and matters requiring attention, convenient to the New York office of the Wellman-Seaver-Morgan Co. will have Mr. Stadelman's personal attention.

LIVERPOOL SHIPPING LETTER

Liverpool, March 20.—The twenty-eighth annual meeting of the Chamber of Shipping of the United Kingdom, at which were present representatives from all the British ports, was held recently, when Mr. F. Shadworth Watts (London), was elected to succeed Mr. W. F. S. Anderson (Glasgow), in the presidential chair. The new president subsequently addressing the chamber on American shipping, said there was no doubt that sooner or later the United States government would pass a ship subsidy bill calculated to cause a rapid increase in the mercantile tonnage under the United States flag, and that in common with the other industries of the republic its mercantile marine would be protected in every possible way against competition in every trade in which the States could in any shape or by any means control. The inducement to add largely to the existing tonnage of the world, afforded by means of government subsidies, was a great menace to the British shipping trade, but he was afraid that it was unlikely that mere representation to foreign governments would have any effect, unless and until his majesty's ministers were in a position to back up their verbal representations by alternative retaliatory measures. In regard to the Suez canal question the council of the chamber, he said, were of the opinion that the government should use its influence to arrange for a joint conference between ship owners and representatives of the Suez canal. In the meantime, let all of them, whose business would in any way admit of it, encourage, so far as practicable, the alternative route by the Cape.

At a recent meeting of the committee of the International Union of Sailing-Ship Owners, it was reported that there was a substantial increase in the number of owners who have joined the union in the several countries it embraces, the percentage of British, French and German sailing ships of over 1,000 tons register which are entered in the union has in the course of the last twelve months increased from 75 per cent to 87 per cent. The figures for the various countries are as follows: Great Britain, 917,889 tons; France, 248,919 tons, and Germany, 259,711 tons; total, 1,426,519 tons.

In this connection there is at the time of writing a conference being held at Copenhagen of European ship owners, in which Britain is taking especial interest. At a meeting of British ship owners held recently at Newcastle, five delegates were elected to represent them at the conference, while the other European countries represented are Russia, France, Holland, Germany, Spain, Denmark, Norway, Sweden and Finland. The conference has elected Mr. Cairns of Cairns, Nobel & Co. as vice president. The questions to be discussed include the fixing of minimum freight rates from the Baltic and the North sea and the formation of an international association of steamship owners engaged in the Baltic and North sea trade.

Mr. Andrew Weir, chairman of the Clyde Sailing Ship Owners' association, speaking at the annual meeting, had something to say upon the efforts of the United States shipping to build up a powerful mercantile marine. Having referred to some of the difficulties which British ship owners had had to face at home, he said they would observe that America was still bent upon reviving her lost mercantile marine apparently at any cost. They would be aware that a bill had been recommended to congress by the Mercantile Marine Commission, prepared for the purpose of increasing and protecting their mercantile marine, and so soon as they could get a fleet to do their own carrying, they would surely exclude British and other shipping from the entire coasting trade; indeed, from July 1 next, they will include the Philippines within their coastal laws. To meet the threatened competition he did not advocate any subsidies for the British ship owners, but only asked for a fair field. Granted this, he was satisfied the British ship owner would hold his own.

Some remarkable results have been achieved in the new type of British cruiser. The Sentinel, the first of the new scouts of the navy, completed her full-speed trials with the following results:—In an eight-hours' run she attained 25¼ knots, being a quarter of a knot in excess of the guarantee, this being the highest speed reached by any vessel other than torpedo craft. The vessel was designed and built by Vickers' Sons & Maxim of Barrow, and it is a new type of cruiser in which naval experts are particularly interested. She is 350 ft. long, her engines indicating 17,000 horse-power. The full-speed trials were of an unusually severe character because of the high speed which had to be developed, the conditions laid down by the admiralty being most exacting. It was stipulated that at the beginning of the eight-hour trial the vessel must make six runs over the measured mile in an hour and a half. This was accomplished, although the sea was rough with a very strong wind. For ten consecutive hours the Sentinel steamed at the rate of 25 knots. The coal consumption also worked out economically. Another vessel of the same type will be launched at Barrow shortly.

Messrs. Elder, Dempster & Co. have decided this week to inaugurate a new service between London and Jamaica in addition to that already established by the firm between Bristol and Port Kingston. The object of the new line is to provide direct shipping facilities between the metropolis and the West Indies, an accommodation which has been requested by mercantile houses. The first sailing will be taken by the Imperial direct West India liner Port Maria, leaving the Thames on Feb. 18. The vessels will call at Bermuda, Sur-la-mer, Montego Bay and Kingston. The service will develop the trade of the island and passengers to and from the ports named will also be carried in the ship. Sir Alfred Jones, K. C. M. G., the head of Messrs. Elder, Dempster & Co., intimates that this new London service does not complete his program for the development of the British West Indies, and further enterprise may be expected in due course.

On Thursday afternoon, Lady White launched from the Neptune Works of Messrs. Swan, Hunter & Wigham Richardson, the triple-screw turbine engined steam yacht Albion, designed by Sir William White, and built to the order of Sir George Newnes, M. P. The steam turbines and main propelling machinery were designed by Mr. Charles Parsons, and manufactured at the Turbinia Works, Wallsend-on-Tyne. Very large bunker capacity has been provided, sufficient indeed to enable the Albion to perform the longest ocean passages, and to undertake a voyage round the world if required. At present coal is to be used, but bunkers have been built so as to be suitable for oil fuel and cylindrical boilers can be readily adapted for burning oil.

The dearness of sugar in Britain has created a profitable market for this article in imports from the United States, and the Lamport and Holt liner Titian, which has just arrived at Manchester from New York, has brought over 2,000 barrels of refined sugar. This is the first shipment of refined sugar made to Manchester from the United States since the opening of the canal. It is to be understood that the importation of refined sugar from the United States is quite a new venture, and that if it turns out successful, the present consignment will be the precursor of much larger purchases from the United States by the Co-operative Wholesale society, the owners of the present consignment.

I learn that it will not be until April or May, 1906, that the two vessels to be built at Fairfield for the Canadian Pacific Railway Co. will be ready. The company's superintendent states that these vessels will form part of a standardized fleet which will be as serviceable on the Pacific ocean as on the Atlantic ocean, and will be the largest vessels that have ever visited the St. Lawrence waters. The speed of these boats is to be 20 knots, and they would therefore be able to carry mails between Queenstown and Rimouski in 5½ days. The distance between Liverpool and Quebec would readily be covered in 6½ days.

SCREW PROPULSION

A writer in Fairplay of London discussing the subject of screw propulsion says:

At the present moment there is not a more tangled subject, nor one more simple when looked at from a proper standpoint, than that of screw propulsion. Some of the greatest engineers say they know very little about screw propellers, that it is all rule of thumb—the ways of the screw being past finding out—and that everything depends on the lines of the ship, etc. The principal reason for all this vagueness is the pernicious theory of the true screw screwing its way through the water as though a nut, and it is safe to say that this theory has cost the country, directly and indirectly, more millions than the Boer war. Any experiments based on this theory—and they are going on today—are condemned beforehand, as they are found on wrong premises. When it takes double the power to drive a ship by her own engines and propeller (as has been proved by the dynamometer) than it does to tow her, equal power being expended in driving the column of water astern as in propelling the ship, what room is left for the true screw theory? Doubtless the screw is there, but where is the nut? A more analogous, though not strictly correct, theory would be to look upon the water disturbance caused by the propeller as the explosion in a gun, the shell representing the ship, and the ship the recoil of the gun. If people would only divest their minds of the obsolete theory of the true screw, and look upon the blade of the propeller simply as a revolving wedge and as a means of wedging a column of water as directly astern as possible, the problem would clear itself to a large extent, as it can be illustrated by everyday subjects on shore.

Everyone knows that where a weight has to be lifted the finer the wedge used the less power will be necessary, and the straighter upward the weight will be lifted. Also, the faster the wedge is driven in the quicker the weight will be lifted. Applying this illustration to the tip of the screw blade wedging water astern, it will be seen that it is a fine wedge driven with great velocity, and owing to the diameter a long pitch can be united with a fine angle, so that the water column is driven directly astern with a minimum of power. The office of the engines is to produce torque or a twisting strain in the shaft; and the office of the propeller is to convert this into a maximum thrust astern with a minimum of side thrust. Obviously, that portion of the blade which, whilst maintaining its pitch, looks most aft and least sideways is the portion which will extort the most stern thrust, and equally obviously that is the tip.

Engineers admit that the middle third of the ordinary propeller is of no use; but one cannot chalk an arbitrary line on the propeller, and say "Inside of this is of no use, but outside this is perfect." The fact is that the blade starts from the center of the shaft (where it is directly fore and aft, and of no use whatever), and gradually increases to its greatest efficiency at the tip. With the ordinary boss on one-sixth the diameter—pitch and diameter being equal—the blade leaves the boss at an angle of about 22 deg. to the line of keel, where of course it is thrusting far more sideways than astern; at about a third of its diameter the blade lies at an angle of about 45 deg. (hence the middle third theory), where it thrusts as much aft as sideways, and goes on to an angle of about 70 deg. to the keel line at the tip, where it thrusts directly aft. Now, without further laboring the point, it may fairly be admitted that the more the power of the engines is got on to the ends of the blades the more efficient will be the propeller. The problem is, how to do it?

Before going into this, it is necessary to point out that the action of the ordinary propeller, with which nine out of every ten ships are fitted, becomes worse as the ship encounters head winds and seas. This is easily seen. If the ship's head were placed against a quay wall, and the engines set full ahead, those portions of the blade lying nearly fore and aft would naturally project water almost athwartship, so that it must follow that the more the ship is checked by head seas the worse will be the action of the propeller, which is directly opposite to what ought to happen. The most usual way of endeavoring to eliminate the middle part of the propeller is by the use of the differential pitch—that is to say that the pitch on the tip of the blade is increased some two or three feet as compared with the root, so that the tip does more work than the root, which runs approximately idle. This scotches the evil to the extent of about a quarter of a knot an hour, but does not by any means kill it; and in going into head seas, which a steamer gets about a third of her time, the fore-and-aft part of the blade comes into play when the ship can least afford it, and the small bossed differential propeller then is only a shade better than the uniform.

The only absolute manner of dealing with the evil middle center portion, either with single or twin screws, is to cut it clean out by the extension of the boss to an extent (say one-third of the diameter) only limited by the means available for getting the drag and suction taken off by casing and cone, and superimpose the differential pitch on this boss. Then the situation becomes a simple one; the whole power of the engines is used on the tips of the blades, and the stream is projected as straight aft as a rifle bullet. Nothing more can be done with the screw propeller, whatever the lines of the ship, though the beneficial effect will show more in a bluff ship than in a fine one, as the blades reach out into solid blue water. This is the ultima thule of the propeller. The difficulty here is to get a sound formula for the difference of pitch (term used for convenience sake only), between the root and the tip, and very much costly experimenting is necessary to find this.

As a comparison between the two styles of propellers, it will be convenient to take an ordinary uniform or true-pitched propeller of 12 ft. diameter. This will have a pitch of 12 ft., a blade area of about 38 per cent of the disc surface (about 43 sq. ft.), and the boss will be about 2 ft. in diameter. Now this is a rigid entity—there is no give-and-take whatever about it. If the engines turn in so many times, the boat will go so many knots. The blade at the root will lie at an angle of about 22 deg. of the line of keel, and at the tip of about 70 deg., an average of 46 deg. If the ship gets into a head sea, the middle half of the propeller thrusts more and more athwartship and therefore becomes less efficient. If this propeller were replaced by a propeller of the same diameter, with a boss of, say 40 per cent, or 47 sq. ft., with a pitch at the root of, say, 11 ft. and at the tip of 13 ft. (exact proportions are not given in any case), the average pitch will be the same, but the action of the propeller will be vastly different. The angle of the blade where it leaves the boss will be about 50 deg., and at the tip about 70 deg.; consequently the average angle of the blade will be 60 deg., and as the average angle of the uniform pitched propeller was only 46 deg., it follows that in the former case the stream must be projected 14 deg. more directly aft than in the latter case, necessarily resulting in a considerable increase in speed. There is no extra strain or torque thrown on the shaft by using only the tips of the blades, as if the horse power is the same the strain is the same, the engines producing the torque, not the propeller. But it is in head winds and seas that the differentiation of long pitches with fine angles shows itself most. As has been shown, in the ordinary propeller we have a rigid entity which grows worse in its action as the weather gets worse. In the large bossed differential we have an elastic quantity both as to pitch and blade area. If the weather is fine, the ship will be propelled by the tips of the blade, which is at an angle of about 50 deg. to the line of keel, comes into play more and more until the cumulative effect is as though a fifth blade had been added to the propeller

for the time being, holding the ship up to the sea, and taking itself off as the weather got finer. In other words, the propeller is a race horse in fine weather, and a cart horse in bad weather.

The particular point which it is desired to strongly enunciate is that, by varying the pitch at these high angles, the question of pitch and blade area is left entirely to the ship, and she will pick out for herself exactly what pitch and blade area she wants for any particular circumstances in which she may be placed. The circumstances at sea vary from hour to hour, and surely it is better to meet these by an automatically self-adjusting quantity than by a fixed quantity only very indifferently suited to the best circumstances.

These are the theories that underlie the Walters' propeller, and that they are correct is borne out by the fact that on the last ship fitted, the steamship Yeoman, the propeller replaced was an ordinary uniform propeller of excellent design; but now the ship goes half a knot faster in fine weather on 14 per cent less consumption, something over two knots more in a heavy head sea, and has never been known to vary more than ten revolutions, light or loaded, in any weather. This latter feature, however, is not entirely due to the pitches, but partially owing to the flywheel action of the large boss.

STEAM NAVIGATION IN EARLY DAYS

Charles H. Haswell, the dean of the marine engineering profession of the United States, in an article in the Scientific American, gives some interesting reminiscences of the early days of steam navigation. He says:

"In 1806 Robert McQueen of Scotland, and a Mr. Sturtevant commenced at the corner of Barley (Reade) and Cross (Center) streets the repairing of steam engines and boilers. In 1813 James P. Allaire, a brass founder, also commenced, under the patronage of Robert Fulton and the elder Gibbons, the repair and construction of steam engines and boilers. The universal type of marine engine then was that of the vertical cross-head. The boiler was that known as a D and kidney flue of copper; so termed as a cross section of the furnace was that of the letter D, and the return flue at its side was shaped alike to a kidney, to conform to that of the curved vertical side of the D. Iron was not used until 1819. Prior to this the boats even hence to Albany had copper boilers. The necessary heavy construction of the hulls of marine vessels was so fixed in the minds of ship builders that they failed to recognize that river, and even coast, navigation did not require it, and as a result the hulls of primitive steamboats were unnecessarily heavy. The scantling of the hull of the James Kent, in service hence to Albany, was that of a seagoing ship. In illustration of this, the Chancellor Livingston, which was built for service hence to Albany about 1812, was in 1826 refitted with engine and boilers and plied hence to Providence, R. I.

"The steam ferryboats hence to Brooklyn and Jersey City had vertical beam engines, with the old parallel motion of Watt to guide the piston rod. Robert L. Stevens in 1826 introduced a single-front link and slides in the ferryboat Newark, hence to Hoboken, and the West Point foundry in 1836 introduced links and slides in the steam ferryboat Jamaica. In 1821 David Dunham and Robert Fulton built a steamship, the Robert Fulton, to ply hence to New Orleans, but the enterprise failing she was sold to the Brazilian government and converted into a frigate. In this year the North America, built by the Messrs. Robert L. and E. A. Stevens, made passage from Albany here in the time, then unprecedented, of ten hours and twenty minutes. A monopoly of the steam service on the Hudson river, which had been enjoyed solely by Robert Fulton and Robert R. Livingston, was set aside by the decision of the chancellor of the state; and the steamboat Olive Branch, in order to avoid the state law, would leave Jersey City early in the morning, run over to New York, leave there at the regular hour of the Albany boats and in returning, after leaving passengers at New York, would pass over to Jersey City for the night. In 1829 a steamboat was advertised to make Sunday excursions. So generally was such a purpose condemned that not only did the clergy denounce it, but a number of our citizens met and expressed displeasure; but it did not avail and excursions were had and have continued ever since. The wail of the clergy was caricatured by the representation of a steamboat leaving her pier so crowded with clergymen and their families that some were shown hanging on to the outside of her rails. It was not until 1826 that inclosed pilot houses were adopted and connection with the engine room effected by bells."

NEED FOR A CONTINUOUS NAVAL PROGRAM

Henry Reuterdahl writing in the Outlook of the need for a continuous building program for the navy says that a certain number of ships should be added to the navy list annually. His argument is as follows:

"The navy stands again at the door of congress asking for the alms of existence, praying for the ships it so sorely needs; and as beggars cannot be choosers, it must accept the two battleships promised and do without the ships recommended by the general board, the authorization of which the president so warmly indorsed. But the congressional committees in a frenzy of economy have refused to accept the suggestions of trained men and their refusal may mean much to our future. While the Hague conference is the goal of mankind's wish for eternal peace, peace just now sleeps behind the big battleship and the swift cruiser. The supremacy of the east is argued, not at this tribunal, but in Manchuria and in the Yellow sea with bayonets and shell; and the mastery of the Caribbean is likely to be in the hands of that nation which is the strongest. Because we improvised frigates in 1812 and ninety-day gunboats in the war of the rebellion, many believe that even in these days a navy can be improved upon at short notice, and that the argument of preparedness is not only a club used by the navy in compelling congress to increase its machinery, but that its doctrines are very much overrated. Thinking ourselves able to wrestle with any problem, and proudly pointing to past history as proof of our ability to do so again, we develop during peace time a spirit of 'we'll lick them, anyhow,' and forget that it is cheaper to prepare before war than to vote, after war breaks out, some fifty millions for war material which cannot be bought instantly. The Spanish war caught us poorly prepared, and it was only good luck and the utter demoralization of an enemy which made our victories so easy. The success of Japan has preached the lesson of naval and military preparedness, but its meaning has not been grasped by congress, although fully understood and constantly advocated by our high naval officers who know that unpreparedness is the surest road to defeat.

"Our next war will be no reconnaissance in force like the Spanish, with its steam yachts as cruisers and banana boats as battleships, but the bona fide article fighting against the well-equipped squadrons of a vigilant enemy. The ships which are to be authorized by the present congress will be of the largest displacement possible—17,000 tons as the maximum, and will carry heavy batteries of ten or twelve inch guns, probably ten in number, augmented by a large number of smaller guns as defense against torpedo craft. A high continuous belt of thick armor will protect their hulls, and as all the turrets are to be installed on the main deck, some thirty feet above the water line, they can fight their guns in any weather and as their great size makes them independent of any sea, they become truly seagoing fighting ships."

PROPOSALS FOR CONSTRUCTION OF BREAKWATER.—U. S. Engineer Office, 262 Huron Street, Cleveland O., April 4, 1905. Sealed proposals for constructing the shore end of the West Breakwater at Fairport Harbor, Ohio, will be received at this office until 2 P.M. May 6, 1905, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. DAN C. KINGMAN, Lieut. Col. Corps of Engineers, U. S. A. Apr. 27.

FALLS HOLLOW STAYBOLT IRON

The Falls Hollow Staybolt Co., Cuyahoga, Falls, O., have just put out a booklet entitled "Irrefutable Evidence." It consists of a great variety of testimonials concerning the value of the Falls Hollow staybolt. In the little booklet the company has gone very exhaustively into the subject of staybolt iron and has accumulated some very valuable information for marine engineers and mechanical men of the railways. The book will be sent upon application to any railroad man, boiler manufacturer or marine engineer. In its introduction to the booklet the company says:

"Falls Hollow staybolt iron has an individuality. It is in a class of its own, and when specified an inferior quality of iron cannot be substituted without immediate detection. We manufacture both hollow and solid staybolt iron bars of the same high grade double refined charcoal iron. We make but one quality of both, and that is the best. The raw material from which our charcoal iron bars are manufactured is imported Swedish blooms, blended with native high grade charcoal iron, which combination, together with the thorough working to which it is subjected by our process, gives a product unsurpassed and proportionately balanced to meet the continuous strains and reverses to which staybolts are subject in a modern high pressure locomotive or marine boiler. It possesses great tenacity and toughness of fibre, and is celebrated for its solidity, tensile strength, ductility, elasticity, and uniformity of quality. We make a specialty of the manufacture of staybolt iron and know the requirements in these days of high pressure locomotive and marine boilers. The best is the cheapest, and that is what we are prepared to furnish. Falls Hollow bars are rolled inside as well as outside from solid material by an improved process which prevents any possibility of defective welds. The skelp, in sections from 2 to 3 ft. long, 3 to 4 in. outside diameter, with an inside diameter of 1 to 1½ in., is rolled (and elongated by a series of welding heats over mandrills varying in sizes 1-16 of an inch) into bars of various lengths, from 8 to 12 ft. long, and of any outside diameter required from ⅞ to 2¼ in. and inside diameter from ⅛ to ⅞ in., dependent on the outside diameter. We recommend bars for staybolt purposes with ⅛-in. (and not over 3-16-in.) hole, as the smaller the hole the stronger the bar, the small hole also being best for the admission of the proper amount of air. We use fuel oil to generate the heat in our furnaces—being pure, there is no sulphur or other impurities to contend with which contaminate iron heated by coal fuel."

TRADE NOTES

The Atlantic Works, Incorporated, 28th street and Grays Ferry road, Philadelphia, recently received an order for one of their large bevel band saw machines, which bevels 45 degrees each side of the center, for the United States navy yard, Mare Island, Cal.

The National Electric Co., Milwaukee, Wis., is issuing periodically a little booklet entitled "Electrical Catechism," the purpose of which is to give information on various electrical subjects. The second issue, just at hand, is devoted to a determination of the units. The circulation is gratuitous and the little periodical will be sent to anyone who might be interested in electrical subjects.

Spon & Chamberlain, 123-125 Liberty street, New York, have just brought out a book entitled "Electrical Instruments and Testing" by Norman H. Schneider. It is of special value to men in central stations and electric power plants and is essentially a practical book for practical men. It shows how to use the voltmeter, ammeter, galvanometer, potentiometer, ohmmeter and the wheatstone bridge.

The publication of the regulations regarding life-saving appliances recently adopted by the United States board of supervising inspectors brings prominently before the public the question of life preservers. During the sessions of the board the various makes of life preservers were subjected to very severe tests with the result that those made from blocks of Acme compressed cork by the Armstrong Cork Co., were pronounced superior to all other makes in every particular. For buoyancy, durability and economy in price and space they are not equalled even by those made from solid natural cork blocks.

The 1905 catalogue of the Waterbury Brass Co., Waterbury, Conn., has just come from the printer's hands. It supplements all previous records, weights and measures. The catalogue has the complete tables and weights of seamless drawn brass and copper tubes, brass and copper in rods, wire and sheets; also tables which are short cuts in arriving at certain results in figuring outside and inside diameters of seamless tubes for the weights and also in connection with rod, wire and sheets in brass and copper, besides a very valuable table of discounts. A great many purchasing agents, engineers and manufacturers who use more or less brass and copper would undoubtedly be glad to avail themselves of the information contained in this little catalogue. It can be had for the asking.

The C. W. Hunt Co., West New Brighton, Staten Island, N. Y., have just put out two interesting pocket size pamphlets devoted to their products. One of them is devoted to the Hunt industrial railways. On the cover the company states that few persons realize the saving made by the use of a narrow gauged base and suitable cars in handling their raw and finished material. Suppose a system of tracks in a manufacturing establishment would save the wages of a boy at only fifty cents per day. This saving of only $150 per year would pay 6 per cent. on an investment of $2,500. One can scarcely imagine a place where so large an investment could be made for a system of tracks of cars and no greater saving result. The other booklet is devoted to the general line of elevating and conveying machinery manufactured by the company.

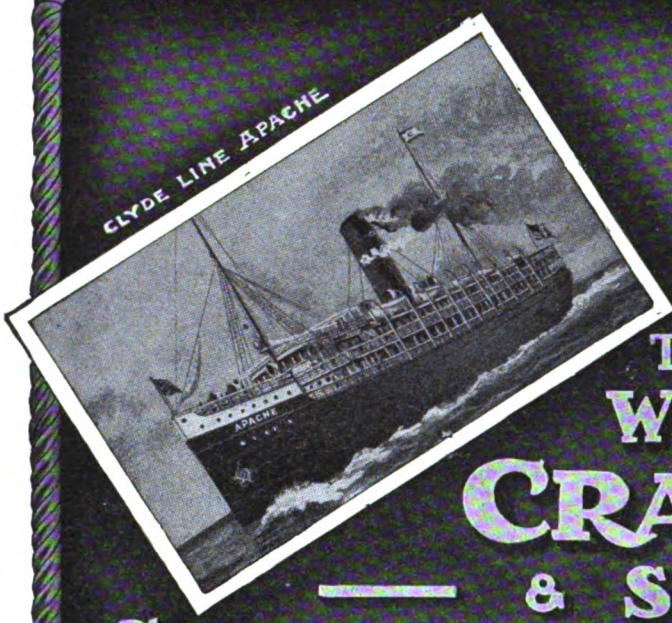
PROPOSALS FOR REPAIRING BREAKWATER.—U. S. Engineer Office, 282 Huron Street. Cleveland, O., April 3, 1905. Sealed proposals for repairing the shore end of the West Breakwater at Cleveland Harbor, Ohio, will be received at this office until 2 P.M., May 6, 1905, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. DAN C. KINGMAN, Lieut. Col. Corps of Engineers, U. S. A. April 27

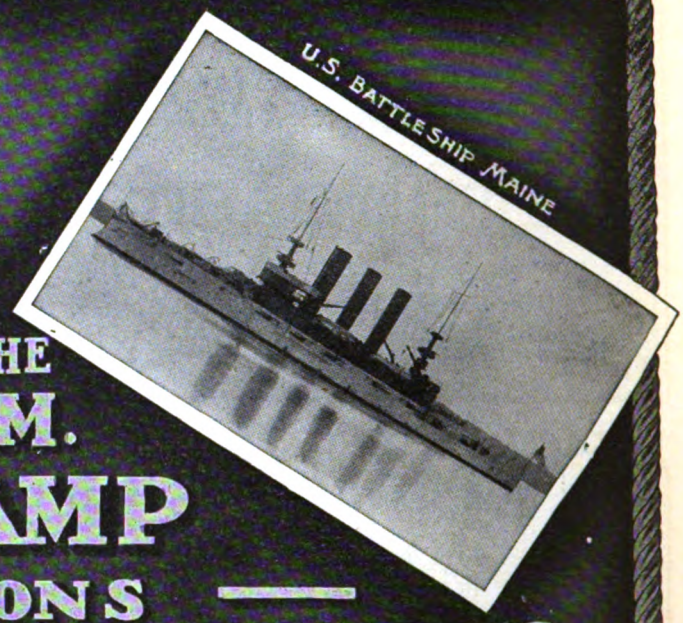
PROPOSALS FOR SHEATHING BREAKWATER.—U. S. Engineer Office, 282 Huron Street, Cleveland, O., April 3, 1905. Sealed proposals for sheathing the harbor face of the West Breakwater at Cleveland Harbor, Ohio, will be received at this office until 2 P.M., May 6 1905, and then publicly opened. Specifications, blank forms and all available information will be furnished on application to this office. DAN C. KINGMAN, Lieut. Col. Corps of Engineers U. S. A. April 27

PROPOSALS FOR RIPRAP STONE FILLING.—U. S. Engineer Office, 282 Huron Street, Cleveland, O., April 3, 1905. Sealed proposals for filling with large riprap along the lake face of the West Breakwater at Cleveland Harbor, Ohio, will be received at this office until 2 P.M. May 6, 1905, and then publicly opened. Specifications, blank forms and all available information will be furnished on application to this office. DAN C. KINGMAN, Lieut. Col. Corps of Engineers, U. S A. April 27

MARINE REVIEW

VOL. XXXI. CLEVELAND, O., APRIL 6, 1905. No. 14.



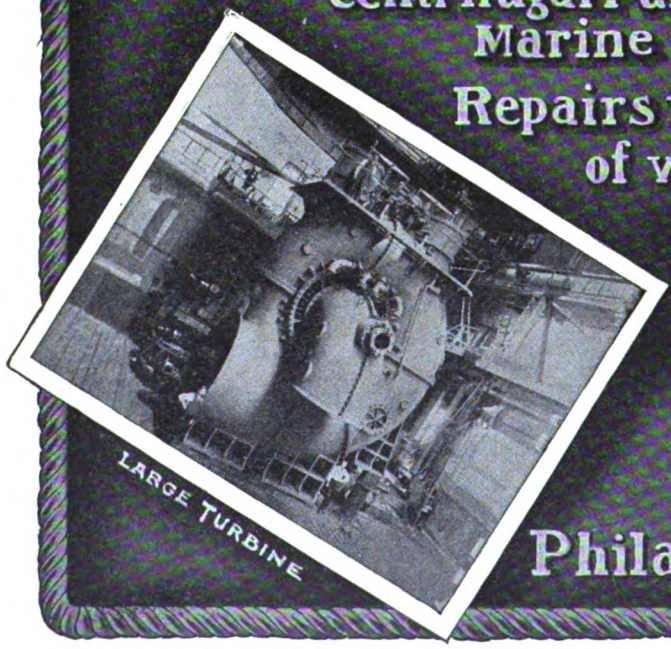


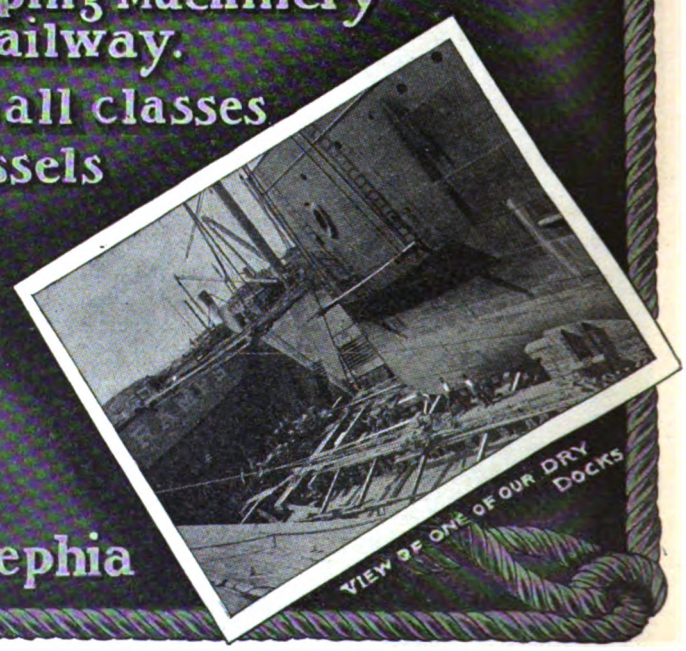
THE
WM.
CRAMP
& SONS
SHIP & ENGINE BUILDING Co.
ESTABLISHED 1830

I.P. MORRIS COMPANY
(ESTABLISHED 1829)

KENSINGTON SHIPYARD Co

WARSHIPS AND MERCHANT STEAMERS
Pumping, Blowing and Hoisting Engines, Dry Docks
Vertical and Horizontal Turbines
Centrifugal Pumping Machinery
Marine Railway.
Repairs to all classes
of vessels





Philadephia

VESSEL AND INSURANCE AGENTS.

JOHN J. BOLAND,
Vessel and Insurance Agent.
25-26 Exchange Bldg., 202 Main St.,
Telephone, Seneca 115. BUFFALO, N. Y.

C. W. Elphicke. J. J. Rardon. M. C. Reuter.
C. W. ELPHICKE & CO.
Vessel and Insurance Agents.
No. 6 Sherman St., CHICAGO, ILL.
Telephone, Harrison 1194.

E. J. FLEMING & CO.
Vessel and Insurance Agents.
2-4 Sherman St., CHICAGO, ILL.
Office: Tel., Harrison 4975. Residence: Tel. Wentworth 5004.

C. P. GILCHRIST & CO.
Vessel and Insurance Agents.
Sale and Exchange of Vessels a Specialty. Lumber and Coal Chartering.
Full Telephone Service, Office and Residence. (Local and Long Distance.)
411 Perry-Payne Bldg., Cleveland, O.

JOHN B. HALL,
Vessel Agent.
17 Exchange Bldg., 202 Main St.,
Telephone, Seneca 892. BUFFALO, N. Y.

W. A. Hawgood. Arthur H. Hawgood.
W. A. HAWGOOD & CO.
Vessel and Insurance Agents.
220-21 Perry-Payne Bldg., Cleveland, O.
Telephones. Office, Main 2395. Res. W. A. Hawgood, Doan 84-J. Res. A. H. Hawgood, Doan 841-J.

D. T. HELM & CO.
Vessel and Insurance Agents.
Telephones—Office 263. Res. 331-3.
DULUTH, - - - MINN.

SAMUEL HOLMES,
Steamship Offices,
For Selling, Chartering and Building all Classes Steam Vessels
Steam Vessel Circulars
Weekly Freight Circulars
Morris Bldg, 66-8 Broad St., New York.

C. L. Hutchinson. W. H. McGean.
HUTCHINSON & CO.
Vessel and Insurance Agents.
Phones: Office, Main 2453. Res. C. L. Hutchinson, Ridge 345 L. Res. W. H. McGean, East 1421-J.
313-15 Perry-Payne Bldg., Cleveland, O.

S. S. LESTER,
Steamship Agent and Freight Broker.
Manager Steamer
ST. LAWRENCE,
83 Dalhousie St QUEBEC, QUE.

VESSEL AND INSURANCE AGENTS.

T. R. McCARTHY,
Steamship and Freight Broker;
Chartering, Forwarding and General Commission Agent; and Broker for the Sale, Purchase and Construction of Steamers and Sailing Vessels.
Marine and Fire Insurance Effected.
Cable Address, "Macarthy, Montreal."
(Watkins', Scott's Liebers and A. B. C. Codes Used.)
Shipping Agent to The Asbestos & Asbestic Co., Ltd., of Danville, Que., and The Belgo Pulp & Paper Co., Shawinigan Falls, Que.
404 Board of Trade Bldg., MONTREAL, CAN.
Correspondence Invited and Agencies Solicited.

J. Mitchell. J. F. Wedow. A. Mitchell.
MITCHELL & CO.
Vessel and Insurance Agents.
508-10 Perry-Payne Bldg., Cleveland, O.
Office Tel. M. 767. Res. John Mitchell, Doan 341. John F. Wedow, Doan 141-J. Alfred Mitchell, Doan 218.

PARKER BROS. CO., LTD.,
Vessel, Marine Insurance and Wrecking Agents. Marine Surveyors.
Office Tel. Main 5314. Night: Main 290. Night: Grand 1723 J.
15 Atwater St. West, DETROIT, MICH.

Insurance.
PRINDIVILLE & COMPANY,
Average Adjusters.
Insurance Brokers.
12 Sherman Street, CHICAGO.
Representing: Johnson & Higgins, New York.

W. C. RICHARDSON,
Vessel Owner and Broker and Marine Insurance Agent.
420-421 Perry Payne Building, CLEVELAND, O.
Office Tel., 338. Residence Tel., 2938.

D. Sullivan. F. J. Sullivan.
D. SULLIVAN & CO.
Vessel Agents.
Marine Insurance.
2-4 Sherman St., CHICAGO, ILL.
Office Tel., Harrison 2847. Res. Ashland 2483.

MARINE INSURANCE,
by
WILLIAM GOW.
Price, $1.50
THE PENTON PUB. CO.,
Cleveland, O.

NAVAL ARCHITECTURE,
by
THOS. H. WATSON.
A manual on laying off iron and steel vessels. Valuable for naval architects as well as beginners in ship yards.
Price, $5.00
Order from
THE PENTON PUB. CO.,
Cleveland, O.

PROCTORS IN ADMIRALTY.

C. E. KREMER,
Counselor at Law and Proctor in Admiralty.
Suite 821-822 New York Life Bldg.,
CHICAGO, ILL.

HOYT, DUSTIN & KELLEY,
Lawyers and Proctors in Admiralty.
Offices, 702 Western Reserve Building,
CLEVELAND, O.

WHITE, JOHNSON, McCASLIN & CANNON,
Attorneys-at-Law and Proctors in Admiralty.
Williamson Bldg, CLEVELAND, O.

GOULDER, HOLDING & MASTEN,
Law Offices.
H. D. Goulder. S. H. Holding. F. S. Masten.
Perry Payne Building,
CLEVELAND, O.

ALBERT J. GILCHRIST,
Proctor in Admiralty.
604 Perry Payne Building,
CLEVELAND, O.

Geo. S. Potter. Meredith Potter.
POTTER & POTTER,
Lawyers and Proctors in Admiralty.
35-36 Dun Building, 110 Pearl Street,
BUFFALO, N. Y.

RAY G. MacDONALD,
Attorney-at-Law and Proctor in Admiralty.
630 First National Bank Building,
Telephone, Central 3507 Automatic 8085 CHICAGO, ILL.

SHAW, WARREN, CADY & OAKES,
Attorneys-at-Law. and Proctors in Admiralty,
Union Trust Bldg, DETROIT, MICH.

HAND BOOK
OF
ADMIRALTY LAW,
by
ROBT. M. HUGHES,
Price, $3.75
THE PENTON PUB. CO.,
Cleveland, O.

PROFESSIONAL.

ROBERT W. HUNT & CO.,

Bureau of Inspection.
Tests and Consultation.

1121 The Rookery, CHICAGO.

Monong. Bank Bldg., PITTSBURG.

66 Broadway, NEW YORK.

Inspectors of shipbuilding material and machinery. Inspectors of all materials. Duty tests of engines and boilers. Physical and chemical laboratories.

PROFESSIONAL.

W. J. WOOD,

Naval Architect, Consulting Engineer.

Prepares designs or working drawings and specifications for all classes of vessels and superintends construction and repairs. Surveys damaged property and estimates cost of repairs. Arbitrator and court expert.

FIRE BOATS A SPECIALTY.

Complete Plans furnished for Steel, Composite or Wooden Vessels.

709 Rialto Building, CHICAGO.

Tel. Harrison 1020.

PROFESSIONAL.

James Nacey. Alexander Hynd.

NACEY & HYND,

Marine Architects.
Mechanical Draughtsmen.
Consulting Engineers.

Specifications and designs for all descriptions of marine vessels, engines and boilers. Supervision of construction and repairs. Damage and other surveys carefully attended to.

Agents for Marine Specialties.

208-9 Western Reserve Building, CLEVELAND, O.

Phone, Main 3339 J.

JOSEPH KIDD,

Marine Architect and Surveyor.

Consulting Ship Builder and Engineer

Over thirty years' experience. Specifications, designs and estimates. Superintendence of construction and repairs. Damage and other surveys carefully attended to. Negotiations for the building, charter or sale of all kinds of vessels and machinery.

610 Board of Trade,

DULUTH, MINN.

John G. Kreer. Ralph M. Parsons.

KREER & PARSONS,

Naval Architects,
Ship Engineers and Builders.

Steel Tugs, Lighters, Barges, Shallow-draft Steamboats for river service. Designers for all classes of Boats and Marine Machinery.

ENGINE TESTS.

Works and Office,
2 to 24 Lawrence St., CHICAGO.

Telephone North 1683.

HENRY RICE and
H. O. LOVEJOY,

Naval Architects.
Consulting Engineers.

Surveyors of Wood and Steel Ships, Engines and Boilers. Estimates of cost given. Superintendence of building and repairing. Plans and specifications furnished for all classes of ships.

Lines and models furnished.

Room 18,
202 Main Street., BUFFALO, N. Y.

NAVAL ARCHITECTS' AND ENGINEERS' DATA BOOK,

By T. H. WATSON.

Price, $1.50

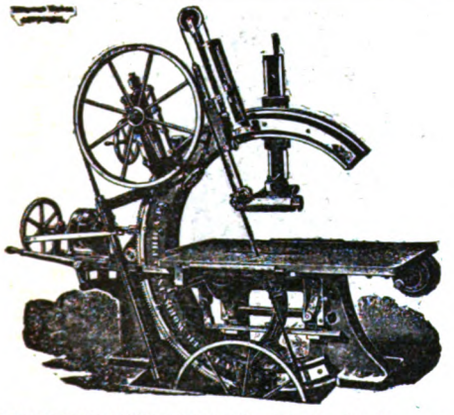
THE PENTON PUB. CO.,
Cleveland, O.

AMBROSE V. POWELL,

Member American Society Civil Engineers
Civil Engineer.

Designs and Constructs Dry Docks, Harbor Works, Docks, and Plant for Handling Coal and Ore, Foundations

Office, 1008 Chamber of Commerce, CHICAGO. ILL.



ADJUSTABLE BEVEL BAND SAW.—Will bevel both ways at 45 degrees. Power Movement to change angles. Power feed in three directions.

ESTABLISHED 1869. INCORPORATED 1896.

ATLANTIC WORKS INCORPORATED,

Successors to Berry & Orton Company.

2870-72-74-76-78 Gray's Ferry Road, PHILADELPHIA, PA.

MANUFACTURERS OF

MACHINERY FOR WORKING WOOD

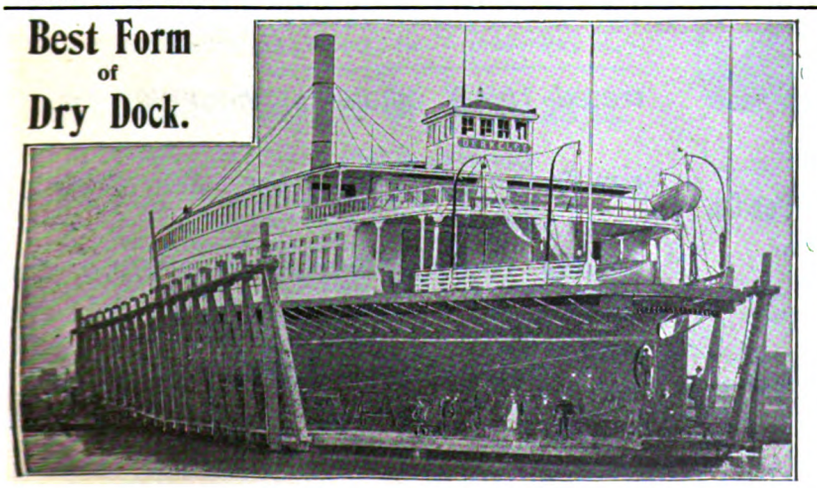
FOR USE IN

Ship Yards, Car Shops, Railroad Shops.

SEND FOR CATALOGUE. ESTIMATES FURNISHED.

Hollow Chisel Mortisers. Car Sill Dressers.

Best Form of Dry Dock.



Crandall's Modern Marine Ry's.

SAFE. RAPID.

Built of Steel or Wood any size.

H. I. Crandall & Son Co.,
(INCORPORATED.)

Contracting Engineers,

EAST BOSTON, MASS., U. S. A.

Buyers' Directory of the Marine Trade

For a more complete classification than that represented by advertisers in the Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, marine and naval directory of the United States, published by The Marine Review, Cleveland.

See accompanying index of Advertisers for full addresses of concerns in this directory.

AIR COMPRESSORS, AIR HOISTS, ETC.
Great Lakes Engineering Works.....Detroit.
Mietz, Aug. .....New York.

AIR PORTS, DEAD LIGHTS, ETC.
Marine Mfg. & Supply Co.....New York.

AIR PUMPS AND APPLIANCES.
Fore River Ship & Engine Co..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.

ANCHORS.
Bowers, L. M. & Co.....Binghamton, N. Y.
Seaboard Steel Casting Co.....Chester, Pa.

ANTI-FOULING AND ANTI-CORROSIVE COMPOSITION FOR STEEL VESSELS.
Holzapfel's American Composition Co.....New York.

ANTI-FRICTION METALS.
Cramp, Wm. & Sons.....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit
Great Lakes Engineering Works.....Detroit
Sturtevant, B. F., Co.....Hyde Park, Mass.

ASH EJECTORS.
Great Lakes Engineering Works.....Detroit.

ATTORNEYS AND PROCTORS IN ADMIRALTY.
Gilchrist, Albert J.....Cleveland.
Goulder, Holding & Masten.....Cleveland.
Hoyt, Dustin & Kelley.....Cleveland.
Kremer, C. E.....Chicago.
MacDonald, Ray G.....Chicago.
Potter & Potter.....Buffalo.
Shaw, Warren, Cady & Oakes.....Detroit.
White, Johnson, McCaslin & Cannon Cleveland

BAROMETERS, MARINE GLASSES, ETC.
Ritchie, E. S. & Sons.....Brookline, Mass.

BELT CONVEYORS.
Link Belt Machinery Co.....Chicago.

BELTING, RUBBER.
New York Belting & Packing Co...New York.

BLOCKS, SHEAVES, ETC.
Boston & Lockport Block Co.....Boston, Mass.
Cleveland Block Co.....Cleveland.

BLOWERS.
Power Specialty Co.....Detroit.
Sturtevant, B. F. Co.....Hyde Park, Mass.

BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, David.....New York.
Lane & DeGroot....Long Island City, N. Y.
Marine Construction & D. D. Co.....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P. & Co. Winthrop Harbor, Ill.

BOILER CLEANING DEVICE.
Power Specialty Co.....Detroit.

BOILER COMPOUNDS.
Dearborn Drug & Chemical Works....Chicago.

BOILER MANUFACTURERS.
Almy Water Tube Boiler Co..Providence, R. I.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Babcock & Wilcox Co.....New York.
Bertram Engine Works Co., Ltd.....Toronto, Can.
Chicago Ship Building Co.....Chicago.
Cramp, Wm. & Sons.....Philadelphia.
Dearing Water Tube Boiler Co.....Detroit.
Delauney, Belleville & Co...St. Denis, France.
Detroit Ship Building Co.....Detroit.
Fletcher, W. A. & Co.....Hoboken, N. J.
Fore River Shipbuilding Co.....Quincy, Mass.
Georgian Bay Engineering Works.....Midland, Ont.
Great Lakes Engineering Works.....Detroit.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Marine Iron Works.....Chicago.

BOILER MANUFACTURERS—Continued.
Maryland Steel Co.....Sparrows Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Mosher Water Tube Boiler Co....New York.
Newport News Ship Building Co.....Newport News, Va.
New York Shipbuilding Co.....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co.....Duluth, Minn.
Roberts Safety Water Tube Boiler Co.....New York.
Stirling, The Co.....Chicago.
Superior Ship Building Co.....Superior, Wis.
Taylor Water Tube Boiler Co.....Detroit.
Willard, Chas. P. & Co..Winthrop Harbor, Ill.

BOILER RIVETS.
Bourne-Fuller Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co..Cuyahoga Falls, O.

BOILER TUBES, MARINE.
Reading Iron Co.....Reading, Pa.

BRASS AND BRONZE CASTINGS.
Cramp, Wm. & Sons.....Philadelphia.
Fore River Ship & Engine Co..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Lunkenheimer Co.....Cincinnati.
Macbeth Iron Co.....Cleveland.

BRIDGES, BUILDERS OF.
Cowing, John P.....Cleveland.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.
Brown Hoisting & Conveying Machine Co.....Cleveland.
McMyler Mfg. Co.....Cleveland.
Mayo & Bailey .....Chicago.

BULKHEAD DOORS, WATERTIGHT.
"Long Arm" System Co.....Cleveland.

CABIN AND CABINET FINISHING WOODS.
Martin-Barriss Co.....Cleveland.

CANVAS SPECIALTIES.
Baker & Co., H. H.....Buffalo.
Bunker, E. A. .....New York.
Upson-Walton Co.....Cleveland.

CAPSTANS.
American Ship Windlass Co..Providence, R. I.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.

CARPETS, RUGS AND FURNITURE.
Williams & Rodgers Co.....Cleveland.

CEMENT, IRON FOR REPAIRING LEAKS.
Smooth-On Mfg. Co.....Jersey City, N. J.

CHAINS.
Woodhouse Chain Works.....Trenton, N. J.

CHAIN CONVEYORS, HOISTS.
Brown Hoisting Machinery Co. (Inc.).....Cleveland.
General Electric Co.....Schenectady, N. Y.

CHAIN HOISTS.
Boston & Lockport Block Co....Boston, Mass.

CHARTS.
Penton Publishing Co.....Cleveland.
Potter, J. D.....London.

CLOCKS (Marine and Ship's Bell) AND CHRONOMETERS.
Ashton Valve Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.
Hanna, M. A. & Co.....Cleveland.
Ironville Dock & Coal Co.....Toledo, O.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.

COAL AND ORE HANDLING MACHINERY.
Brown Hoisting Machinery Co. (Inc.).....Cleveland.
Link Belt Machinery Co.....Chicago.
McMyler Mfg. Co.....Cleveland.

COMPASSES.
Ritchie, E. S. & Sons.....Brookline, Mass.

CONDENSERS.
Great Lakes Engineering Works.....Detroit.
Thropp & Sons Co., John E...Trenton, N. J.

CONTRACTORS' SUPPLIES.
Contractors Supply & Equipment Co...Chicago.

CONTRACTORS FOR PUBLIC WORKS.
Breymann & Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Chicago & Gt. Lakes Dredge & Dock Co.....Chicago.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Lake Superior Contracting & Dredging Co.....Duluth, Minn.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
Sullivan, M.....Detroit.

CORDAGE.
Baker & Co., H. H.....Buffalo.
Upson-Walton Co.....Cleveland.

CORK JACKETS AND RINGS.
Armstrong Cork Co.....Pittsburg, Pa.
Kahnweiler's Sons, D.....New York.

CRANES, TRAVELING.
Brown Hoisting Machinery Co.....Cleveland.
McMyler Mfg. Co.....Cleveland.

DIVING APPARATUS.
Morse, A. J. & Son.....Boston.
Schrader's Son, A.....New York.

DREDGING CONTRACTORS.
Breymann & Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Chicago & Gt. Lakes Dredge & Dock Co.....Chicago.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Lake Superior Contracting & Dredging Co.....Duluth, Minn.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
Sullivan, M.....Detroit.

DRYING APPARATUS.
Sturtevant, B. F. Co.....Hyde Park, Mass.

DRY DOCKS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works.....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.....Newport News, Va.
Shipowners Dry Dock Co.....Chicago.
Superior Ship Building Co....Superior, Wis.

ELECTRIC HOISTS AND CRANES.
General Electric Co.....Schenectady, N. Y.

ELECTRIC LIGHT AND POWER PLANTS.
General Electric Co.....Schenectady, N. Y.
Mietz, Aug.....New York.
Sturtevant, B. F. & Co.....Hyde Park, Mass.
Thropp & Sons, John E.....Trenton, N. J.

WANTED and FOR SALE Department.

FOR SALE.

Schooner For Sale.

Schooner Minnie Slauson for sale. Rate A2, net tonage 271. Good condition. For information address Capt. L. E Larson, Manitowoc, Wis. Mar 30

Steam Barge for Sale.

For Sale.—Steam barge, 131 ft. keel, 25 ft. beam, 9 ft. deep Capacity, lumber, 260 M. ft.; coal, 400 tons. Good power; can handle two or three barges. Everything pertaining to this boat is in good condition. Terms cash. Address Lock Box 35, St. Clair, Mich. Mar. 30

Marine Engines for Sale.

The following 2-cycle, 2-cylinder Marine Engines. New. Guaranteed to be first-class: Two 10 H.P., make and break ignition, price, each, $180.00; one 10 H.P. jump spark ignition, price, $180.00; two 8 H.P., make and break ignition, price, each, $165.00; one 10 H.P., second-hand, make and break ignition, price, $150.00. Also the following single cylinder, 2-cycle Engines. New; make and break igniters; guaranteed first-class: Two 5 H.P., price each, $85.00; four 4 H.P., price each, $75.00; two 2½ H. P., price each, $60.00; two 1¼ H P., price each, $35.00. Address for catalogue, W. E. Schaefer, Ripon, Wis. Mar. 30

FOR SALE.

Lake Tug for Sale.

Tug Kate Williams—rebuilt 1901, rates 1½. Moored Manitowoc, Wis., where she may be inspected For prices and terms address Lake Shore Stone Co., Milwaukee, Wis. Apr. 20

Dredging Outfits for Sale.

Two dipper dredges one partly burned; two combination dipper and clam shell dredges; four tugs; dump scows; flat scows; dredging appliances. Complete business to be closed out. For particulars address Carkin, Stickney & Cram, Detroit. Apr. 20

Motor Boat For Sale.

On the St. Lawrence river: A specially built motor boat, 32x6, fitted with a double cylinder 14 horse motor A remarkably beautiful and excellent boat, but as the owner thinks it too small for his use, will sacrifice so as to build a larger one Big bargain for some one. It is almost finished. Do not overlook this. I have dozens of other hulls in stock, all sizes, all prices, or will build to order anything you want. Henry E. Francis Jr., Alexandria Bay, N. Y. t.f

FOR SALE.

Launch For Sale.

42-foot full cabin, mahogany finished cruising launch. Handsomely upholstered; full inventory; first class condition. Address W. E. Mallory, Danbury, Conn. Apr. 13

For Sale.

Marine boiler and engine complete. Boiler 4 x 8, allowed 120 lbs. steam. Engine 12 square, high pressure. All in good condition. Address Box 48, Sandusky, O. April 20

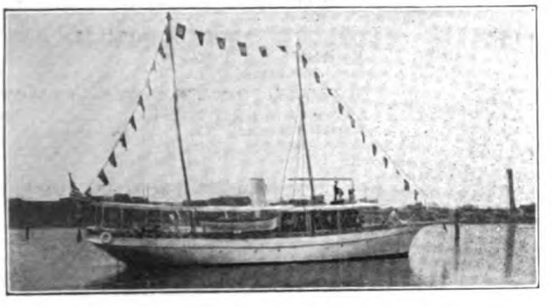
Sand Sucker for Sale.

Capacity 850 bbls. American bottom. Engine, pumps and hoist in first-class condition. Moored at Windsor, Ont., where steamer can be inspected. For information and price address C. W. Cadwell, Windsor, Ont. Apr. 6

PERSONAL

Whereabouts of William Hudson Wanted.

Anyone who can furnish any information of the whereabouts of William Hudson, please communicate with Esther M. Boyd, 330 Wood Ave., Muskegon, Mich. When last heard of he was captain of the George Dunbar on Lake Michigan. Apr. 6



Steam Yacht Catherine.

FOR SALE—Length 78 ft., beam 18 ft., triple expansion engines, water-tube boiler, allowed 200 lbs.; electric light, search light, mahogany deck-house 9 x 16, power launch, complete outfit, all in first-class condition. One of the best family cruising yachts on the Lakes. Inquire Wickes Bros., Saginaw, Mich. tf

Buyers' Directory of the Marine Trade.—*Continued.*

ENGINE BUILDERS, MARINE.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bertram Engine Works Co., Ltd.....Toronto, Can.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Dake Engine Co.....Grand Haven, Mich.
Detroit Ship Building Co.....Detroit.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Shipbuilding Co....Quincy, Mass.
Great Lakes Engineering Works.Detroit, Mich.
Hall Bros. .....Philadelphia.
Lockwood Mfg. Co.....East Boston, Mass.
Marine Iron Works.....Chicago.
Maryland Steel Co.....Sparrows Point, Md.
Mietz, Aug.....New York.
Milwaukee Dry Dock Co.....Milwaukee.
Mosher, Chas. D.....New York.
Moulton Steering Engine Co.....New York.
Newport News Ship Building Co.....Newport News, Va.
New York Shipbuilding Co....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co... Duluth, Mich.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co....Superior, Wis.
Thropp, J. E. & Sons Co.....Trenton, N. J.
Trout, H. G.....Buffalo.
Willard, Chas. P. & Co..Winthrop Harbor, Ill.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.
Cory, Chas. & Son.....New York.
Marine Mfg. Supply Co.....New York.

ENGINE TESTING.
Kreer & Parsons.....Chicago.

ENGINEERING SPECIALTIES AND SUPPLIES.
Crane Co. .....Chicago.
Kieley & Mueller .....New York.
Lunkenheimer Co. .....Cincinnati.
New York Belting & Packing Co..New York.
Northwestern Steam Boiler & Mfg. Co... Duluth, Minn.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.
Hynd, Alexander .....Cleveland.
Hunt, Robt. W. & Co.....Chicago.
Kidd, Joseph.....Duluth, Minn.
Kreer & Parsons.....Chicago.
Lovejoy, H. O.....Buffalo.
Matteson & Drake.....Philadelphia.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Rice, Henry .....Buffalo.
Roelker, H. B. .....New York.
Wood, W. J. .....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.
Sturtevant, B. F. Co.....Hyde Park, Mass.

FEED WATER PURIFIERS AND HEATERS.
Greacen-Derby Engineering Co.....Perth Amboy, N. J.
Reilly Repair and Supply Co., Jas..New York.
Ross Valve Co.....Troy, N. Y.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.
General Electric Co.....Schenectady, N. Y.

FORGES.
Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.
Cleveland City Forge & Iron Co...Cleveland.
Fore River Shipbuilding Co.....Quincy, Mass.
Macbeth Iron Co.....Cleveland.

FLUE WELDING.
Fix's, S. Sons.....Cleveland.

FUEL ECONOMIZERS.
Sturtevant Co., B. F.....Hyde Park, Mass.

FUELING COMPANIES AND COAL DEALERS.
Hanna, M. A. & Co.....Cleveland.
Ironville Dock & Coal Co.....Toledo, O.
Parker Bros. Co., Ltd.....Detroit.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Smith, Stanley B., & Co.....Detroit.
Smith Coal & Dock Co., Stanley B. Toledo, O.

FUELING PLANTS, BUILDERS OF
Link Belt Machinery Co.....Chicago.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

GASKETS, RUBBER.
New York Belting & Packing Co...New York.

GAS BUOYS.
Safety Car Heating & Lighting Co..New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.
Georgian Bay Engineering Works.....Midland, Ont.

GAUGES, STEAM AND VACUUM.
American Steam Gauge & Valve Mfg. Co .....Boston.
Ashton Valve Co.....Boston.
Lunkenheimer Co. .....Cincinnati.

GAUGES, WATER.
Bonner & Co., Wm. T.....Boston.
Lunkenheimer Co. .....Cincinnati, O.

GRAPHITE.
Dixon Crucible Co., Joseph..Jersey City, N. J

GREASE EXTRACTORS.
Greacen-Derby Engineering Co.....Perth Amboy, N. J.

HAMMERS, STEAM.
Chase Machine Co.....Cleveland.

HEATING APPARATUS.
Sturtevant, B. F. Co.....Hyde Park, Mass.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co. (Inc.).... .....Cleveland.
Chase Machine Co.....Cleveland.
General Electric Co.....New York.
Georgian Bay Engineering Works.....Midland, Ont.
Hyde Windlass Co.....Bath, Me.
McMyler Mfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
Mietz, Aug. .....New York.

HOLLOW STAYBOLT IRON.
Falls Hollow Staybolt Co...Cuyahoga Falls, O.

HOSE, RUBBER.
New York Belting & Packing Co..New York.

HYDRAULIC DREDGES.
Great Lakes Engineering Works.....Detroit.

HYDRAULIC TOOLS.
Watson-Stillman Co., The.....New York.

ICE MACHINERY.
Great Lakes Engineering Works.....Detroit.
Roelker, H. B.....New York.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.

INJECTORS.
American Injector Co.....Detroit.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Lunkenheimer Co.....Cincinnati.
Penberthy Injector Co.....Detroit, Mich.

INSURANCE, MARINE.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., E. J.....Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A.....Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.
McCurdy, Geo. L.....Chicago.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Peck, Chas. E. & W. F..New York & Chicago.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

IRON CASTINGS.
Reading Iron Co.....Reading, Pa.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland, O.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Reading Iron Co.....Reading, Pa.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.
Georgian Bay Engineering Works.....Midland, Ont.
Marine Iron Works.....Chicago.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P.....Winthrop Harbor, Ill.

LIFE PRESERVERS, LIFE BOATS, BUOYS.
Armstrong, Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIGHTS, SIDE AND SIGNAL.
Russell & Watson .....Buffalo.

LOGS.
Nicholson Ship Log Co.....Cleveland.
Walker & Sons, Thomas....Birmingham, Eng.
Also Ship Chandlers.

LUBRICATING GRAPHITE.
Dixon Crucible Co., Joseph..Jersey City, N. J.

LUBRICATORS.
Crane Co.....Chicago.
Lunkenheimer Co. .....Cincinnati.

LUMBER.
Martin-Barriss Co.....Cleveland.

MACHINISTS.
Chase Machine Co.....Cleveland.
Hickler Bros.....Sault Ste. Marie, Mich.
Lockwood Mfg. Co.....East Boston, Mass.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

MARINE RAILWAYS.
Hickler Bros.....Sault Ste. Marie, Mich.

MARINE RAILWAYS, BUILDERS OF.
Crandall & Son, H. I....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works.....Detroit.
Sturtevant, B. F. Co.....Hyde Park, Mass.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.

METAL POLISH.
Bertram's Oil Polish Co.....Boston.

MOTORS, GENERATORS—ELECTRIC.
Fisher Electrical Works.....Detroit.
General Electric Co.....Schenectady, N. Y.
Sturtevant, B. F. Co.....Hyde Park, Mass.

NAUTICAL INSTRUMENTS.
Ritchie, E. S., & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.
Hynd, Alexander .....Cleveland.
Kidd, Joseph .....Duluth, Minn.
Kreer & Parsons.....Chicago.
Lovejoy, H. O. .....Buffalo.
Matteson & Drake.....Philadelphia.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Rice, Henry .....Buffalo.
Wood, W. J. .....Chicago.

OAKUM.
Stratford, Oakum Co.....Jersey City, N. J.

OIL ENGINES.
Mietz, Aug. .....New York.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph..Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Katzenstein, L. & Co.....New York.
New York Belting & Packing Co..New York.

PACKING TOOL.
Matteson & Drake .....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Carbolineum Wood Preserving Co..Milwaukee.
New Jersey Zinc Co.....New York.
Upson-Walton Co. .....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

Buyers' Directory of the Marine Trade.—*Continued.*

PILE DRIVING AND SUBMARINE WORK.

Buffalo Dredging Co.....Buffalo.
Chicago & Gt. Lakes Dredge & Dock Co. ..... Chicago.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Lake Superior Contracting & Dredging Co. ..... Duluth, Minn.
Parker Bros. Co., Ltd.....Detroit.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
Sullivan, M..... Detroit

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland, O.
Crane Co. .....Chicago.
Macbeth Iron Co.....Cleveland.
Reading Iron Co.....Reading. Pa.

PLANING MILL MACHINERY.

Atlantic Works, Inc.....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.
Reading Iron Co.....Reading, Pa.

PRESSURE REGULATORS.

Kieley & Mueller .....New York.
Ross Valve Co.....Troy, N. Y.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Fore River Shipbuilding Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lockwood Mfg. Co. .....East Boston, Mass.
Marine Iron Works.....Chicago.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co..... .....Newport News, Va.
Roelker, H. B.....New York.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co....Superior, Wis.
Thropp & Sons Co., J. E.....Trenton, N. J.
Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.

General Electric Co.....Schenectady, N. Y.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F., Mfg. Co.....New York.
Great Lakes Engineering Works.....Detroit.
Marine Iron Works.....Chicago.
Kingsford Foundry & Machine Works..... .....Oswego, N. Y.

RANGES.

Stamford Foundry Co.....Stamford, Conn.

REFRIGERATING APPARATUS.

Great Lakes Engineering Works.....Detroit.
Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Cleveland.

REPAIRS—ENGINE AND BOILER.

(See also Boiler Manufacturers and Engine Builders.)
Georgian Bay Engineering Works..... .....Midland, Ont.

RIVETS, STEEL FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland, O.

SAFETY VALVES.

American Steam Gauge & Valve Mfg. Co. ..... Boston.
Ashton Valve Co.....Boston.
Crane Co. .....Chicago.
Lunkenheimer Co. .....Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.

SALVAGE COMPANIES.

See Wrecking Companies.

SEARCH LIGHTS.

General Electric Co.....Schenectady, N. Y.

SHEARS.

See Punches, Rivets, and Shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.
Reading Iron Co.....Reading, Pa.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
Atlantic Works .....East Boston, Mass.
Bertram Engine Works Co., Ltd.Toronto, Can.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Ship Building Co.....Detroit.
Fore River Shipbuilding Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrows Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co..... .....Newport News, Va.
New York Shipbuilding Co....Camden, N. J.
Roach's Ship Yard.....Chester, Pa.
Shipowner's Dry Dock Co.....Chicago.
Smith & Son, Abram.....Algonac, Mich.
Willard, Chas. P. & Co. Winthrop Harbor, Ill.

SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.
Marine Mfg. & Supply Co.....New York.
Upson-Walton Co.....Cleveland.

SHIP DESIGNERS.

Kidd, Joseph .....Duluth.
Kreer & Parsons .....Chicago.
Matteson & Drake .....Buffalo.
Rice & Lovejoy .....Buffalo.
Steel, Nacey & Hynd.....Cleveland.
Wood, W. J.....Chicago.

SHIP LANTERNS AND LAMPS.

Russell & Watson.....Buffalo.

SHIPMATE RANGES.

Stamford Foundry Co.....Stamford, Conn.

SHIP TIMBER.

Martin-Barriss Co.....Cleveland.

SMOOTH-ON COMPOUND, FOR REPAIRS.

Smooth-On Mfg. Co.....Jersey City, N. J.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co..Cuyahoga Falls, O.
Reading Iron Co.....Reading, Pa.

STEAM VESSELS FOR SALE.

Gilchrist & Co., C. P.....Cleveland.
Holmes, Samuel .....New York.
Lester, S. S.....Quebec, Can.
McCarthy, T. R.....Montreal, Can.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line .....New York.
Anchor Line .....Buffalo.
Boston Steamship Co.....Boston.
International Mercantile Marine Co..... ..... Philadelphia.
New York & Cuba Mail S. S. Co...New York.
Red Star Line.....New York.
United Fruit Co.....Boston

STEEL CASTINGS.

Otis Steel Co.....Cleveland.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Ship Building Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.
Moulton Steering Engine Co.....New York.
Sheriffs Mfg. Co.....Milwaukee.

SUBMARINE DIVING APPARATUS.

Morse & Son, A. J.....Boston.
Schrader's Son, A.....New York.

SURVEYORS, MARINE.

Gaskin, Edward .....Buffalo.
Hynd, Alexander .....Cleveland.
Lovejoy, H. O.....Buffalo.
Matteson & Drake .....Philadelphia.
Parker Bros. Co., Ltd.....Detroit.
Nacey, James .....Cleveland.
Rice, Henry .....Buffalo.
Steel, Adam .....Cleveland.
Wood, W. J.....Chicago.

TESTS OF MATERIALS.

Hunt, Robert W. & Co.....Chicago.
Lunkenheimer Co.....Cincinnati, O.

TILING, INTERLOCKING RUBBER.

New York Belting & Packing Co..New York.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Watson-Stillman Co.....New York.

TOOLS, WOOD WORKING.

Atlantic Works, Inc.....Philadelphia.

TOWING MACHINES.

American Ship Windlass Co..Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co..... .....Kingston, Ont.

TRAPS, STEAM.

Kieley & Mueller .....New York.
Sturtevant Co., B. F.....Hyde Park, Mass.

TRUCKS.

Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.

Shelby Steel Tube Co.....Pittsburg, Pa.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Guage & Valve Mfg. Co. ..... Boston.
Ashton Valve Co.....Boston.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Kieley & Mueller.....New York.
Lunkenheimer Co.....Cincinnati.
Ross Valve Co.....Troy, N. Y.

VALVES FOR WATER AND GAS.

Lunkenheimer Co.....Cincinnati.
Ross Valve Co.....Troy, N. Y.

VARNISHES.

Detroit Varnish Co.....Detroit.
Detroit White Lead Works.....Detroit.
New Jersey Zinc Co.....New York.
Also Ship Chandlers.

VENTILATING APPARATUS FOR SHIPS.

Sturtevant, B. F. Co.....Hyde Park, Mass.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., E. J.....Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hall, John B.....Buffalo.
Helm & Co., D. T.....Duluth.
Hawgood & Co., W. A.....Cleveland.
Holmes, Samuel .....New York.
Hutchinson & Co.....Cleveland.
Lester, S. S. .....Quebec, Can.
McCarthy, T. R.....Montreal.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

VESSEL FURNISHINGS.

Williams & Rodgers Co.....Cleveland.

WATER GAUGES.

Bonner & Co., Wm. T.....Boston.
Lunkenheimer Co.....Cincinnati, O.

WATERTIGHT BULKHEAD DOORS.

"Long Arm" System Co.....Cleveland.

WHISTLES, STEAM.

American Steam Gauge & Valve Mfg. Co. ..... Boston.
Ashton Valve Co.....Boston.
Lunkenheimer Co.....Cincinnati.

WILFORD'S WATERPROOF CLOTH.

Bunker, E. A. .....New York.

WIRE ROPE AND WIRE ROPE FITTINGS.

Baker, H. H. & Co.....Buffalo.
DeGrauw, Aymar & Co.....New York.
Upson-Walton Co.....Cleveland.

WINDLASSES.

American Ship Windlass Co..Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.

WINCHES.

American Ship Windlass Co..Providence, R. I.
Georgian Bay Engineering Works..... .....Midland, Ont.
Hyde Windlass Co.....Bath, Me.

WOOD PRESERVING PAINT.

Carbolineum Wood Preserving Co..Milwaukee.

WOOD WORKING MACHINERY.

Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co..... .....Kingston, Ont.
Parker Bros. Co., Ltd.....Detroit.

YACHT AND BOAT BUILDERS.

Bertram Engine Works Co., Ltd..Toronto, Can.
Drein, Thos. & Son.....Wilmington, Del.
Georgian Bay Engineering Works..... .....Midland, Ont.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P. & Co..... .....Winthrop Harbor, Ill.

YACHT BROKERS.

Clapham & Clapham.....New York.

YAWLS.

Drein, Thos. & Son.....Wilmington, Del.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.
The dagger (†) indicates that advertisement appears once a month.

LAKE SHORE AND MICHIGAN SOUTHERN RY.

Eastward	Arrive from West	Depart East
No. 18, Southwestern Limited	.....	*1:50 a.m.
No. 22, Lake Shore Limited	*2:12 a.m.	*2:20 a.m.
No. 20, Chicago and Cleveland Exp.	*7:20 a.m.	.....
No. 28, New York and Boston Exp.	*7:40 a.m.	*8:00 a.m.
No. 40, Toledo and Buffalo Accom	†10:00 a.m.	†10:30 a.m.
No. 32, Fast Mail	*11:25 a.m.	*11:30 a.m.
No. 48, Accommodation via Sandusky	†1:40 p.m.	.....
No. 42, Boston-New York Express	.....	*11:45 a.m.
No. 44, Cleveland and New York Spl.	.....	*3:00 p.m.
No. 46, Southwestern Express	.....	*3:10 p.m.
No. 116, Ashtabula Accommodation	.....	†4:30 p.m.
No. 6, Limited Fast Mail	*5:40 p.m.	*5:45 p.m.
No. 26, 20th Century Limited	*7:40 p.m.	*7:43 p.m.
No. 10, Chicago, N.Y. & Boston Spl.	*7:30 p.m.	*7:50 p.m.
No. 16, New England Express	*10:30 p.m.	*10:35 p.m.
No. 2, Day Express	†9:10 p.m.	†9:25 p.m.
No. 126, Norwalk Accommodation	†7:55 a.m.	.....

Westward	Arrive from East	Depart West
No. 7, Exposition Limited	*12:50 a.m.	.....
No. 11, Southwestern Limited	*2:55 a.m.	.....
No. 9, Day Express	.....	†6:00 a.m.
No. 15, Boston and Chicago Special	*3:10 a.m.	*3:15 a.m.
No. 19, Lake Shore Limited	*7:15 a.m.	*7:25 a.m.
No. 23, Western Express	*10:30 a.m.	*10:35 a.m.
No. 29, Southwestern Special	‡11:10 a.m.	.....
No. 33, Southwestern Express	*12:25 p.m.	.....
No. 133, Cleveland and Detroit Exp.	.....	*12:45 p.m.
No. 47, Accommodation	†11:00 a.m.	†3:00 p.m.
No. 141, Sandusky Accommodation	.....	†3:10 p.m.
No. 43, Fast Mail	*4:35 p.m.	*4:40 p.m.
No. 127, Norwalk Accommodation	.....	†5:10 p.m.
No. 37, Pacific Express	*6:50 p.m.	*7:20 p.m.
No. 3, Fast Mail Limited	*10.50 p.m.	*10:55 p.m.
No 115, Ashtabula Accommodation	*8.30 a.m.	.....

*Daily. †Except Sunday. ‡Except Monday.
Trains Nos. 23, 28 and 37 run via Erie Station.
City Ticket Office, 237 Superior St